[Entered at the Post Office of New York, N. Y., as Second Class Matter.]

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. LVI.—No. 12. [NEW SERIES.] NEW YORK, MARCH 19, 1887. [$3.00 per Year.

A SNOW YACHT ON A DAKOTA PRAIRIE.

In the SCIENTIFIC AMERICAN of November 14, 1885, we gave some interesting illustrations of sail skating, as practiced in the vicinity of Copenhagen, Denmark, and the enlivening sport which is to be had out of the ice boat, as the swift craft are managed by Hudson River ice yachtmen, has often been described; but the illustration herewith represents a decidedly new phase of exhilarating enjoyment in diversions of this kind. It is a practical snow yacht, constructed and used during the past winter by Dr. H. M. Wheeler, of Grand Forks, Dakota, our illustrations being made from photographs which he has furnished us.

This snow yacht of the prairie is 32 ft. long and 14 ft. beam, with mast 20 ft., main boom 22 ft., gaff 12 ft., and jib boom 12½ ft. The frame is of 2 in. by 8 in. plank, set vertically. The runner plank double. The mast is set between 2 in. by 12 in. plank, that taper to 8 in. high at each side, and are 6 in. apart. The runners are strong toboggans; the front ones being 1 ft. wide, and made of ⅞ in. ash, 9 ft. on the run, and turned up 18 in. in front. They are hung to the runner plank with hinge joints, and stayed by malleable iron braces from runner plank to inner and front part of runner. The front runners are made of four 3 in. strips of ash, and have a central shoe 2 ft. long, projecting 1¼ in. to prevent drifting. The rear runner resembles the front ones, except that it is only 6 in. wide, being made of two strips of ash. The framework is 3 ft. across the stern, and the tiller is attached directly to the rear runner, instead of to the rudder post, in which position it did not stand the strain.

The speed of this yacht is given by its builder as from ten to forty miles an hour; but this must be with the wind on the beam, as she will not gain much with the wind at a right angle, and hence cannot beat up to windward. When going about, it is done by wearing.

The past winter has afforded considerable sport to owners of ice yachts, but who can say that the blizzards of the Northwest are not hereafter to be relieved of some of their terrors by this snow yacht of the prairie, and that the new sport may not become as fashionable in the future as buffalo hunting was ten or fifteen years ago?

SAILING BEFORE THE WIND IN A SNOW YACHT ON A DAKOTA PRAIRIE.

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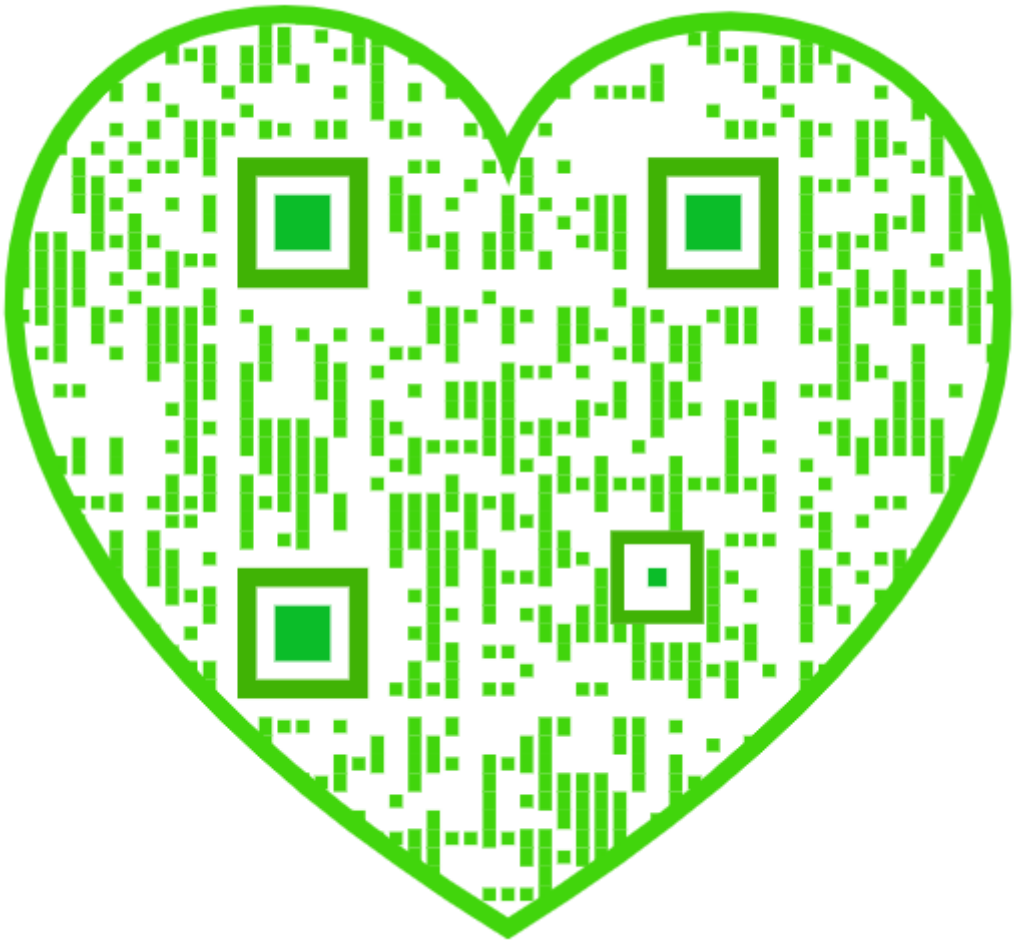

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, NEW YORK.

O. D. MUNN. A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.

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NEW YORK, SATURDAY, MARCH 19, 1887.

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THE SALE OF THE BRITISH ADMIRALTY PLANS.

The British Government has detected the sale of certain naval plans and specifications, which were in the custody of the Chatham dock yards.

The Naval Department of the United States has started on the work of building ships, and recently purchased from a private English constructor the plans for a vessel. Considerable comment was devoted to this transaction by the English journals. They deemed the ship builder's action unpatriotic. But the enormity of the more recent transaction completely overshadows any evil discernible in Secretary Whitney's purchase. A draughtsman in the pay and employ of the government steals and sells its own private plans and specifications.

Hence, when the question arose of who the purchaser could be, America was first settled upon as the criminal.

A cable message, dated March 11, disposes of this rumor. An official announcement is made that the British authorities hold the name of the purchaser, and are in receipt of trustworty information that the naval department of Russia is the culprit.

The exoneration of America from any share in the transaction is said to be complete. The unfortunate draughtsman has been discharged, and may be further proceeded against. Parliamentary action, government prosecution, and indictment for perjury threaten him, Russia has not yet been communicated with, but presumably will be well able to take care of herself.

The fact that the United States are no longer "in it" is, from an American point of view, a gratification. It would be a slur upon the ingenuity and resources of our engineers and inventors to acknowlege that we could not build a war vessel upon American lines. In the past our inventors have always risen to urgent occasions, until their quick and ready way of dealing with emergencies has become a proverbial attribute of Americans. The advertisements in the foreign journals bear their tribute to the ingenuity of the people of this country, where special tools, household implements, steam pumps, and other articles are heralded as of American invention. No foreign aid is needed to enable us to build war vessels.

The inventive genius of the United States can do as well as the British Admiralty in designing ships. Rigid adherence to precedence, an unwillingness to test new designs, and a want of confidence in ourselves, would be a very poor basis for action in establishing a navy. The successful war vessel of the future will probably involve many new features. It will be based as much on original thought as on precedents. To cope with those already existing it must be more than a duplication of its possible antagonists. For us to simply copy the ships of Great Britain would be a sure means to keep our navy behind the age, as the patterns would always lead the copy by some years.

JAMES BUCHANAN EADS, C.E.

In the history of American enterprise and engineering, the name of Captain Eads has long held a foremost place. By personal qualities of the highest order, and indomitable will and persistence, he won for himself a world-wide reputation in his profession. His fame was as great in England as here, and she was most generous in her tributes to his genius. His death has now to be chronicled with unfeigned regret. He died at Nassau, on the 8th of March, of pneumonia. He was a typical American in his inventiveness and powers of resource, and stood with but few equals in the front rank of the world's engineers.

He was born at Lawrenceburg, Ind., on May 23, 1820. From the age of eight, he showed more than the usual boy's interest in mechanics, and a couple of years later, at Louisville, whither his family had moved, possessed a workshop of his own, fitted up for him by his father, where he made all sorts of models for his amusement. Three years later the family removed to St. Louis. The steamer carrying them burned, and all his father's possessions were destroyed. Landing a barefooted boy, it is said that he began life by selling apples for a living. Eventually he became a clerk in a business house, and in 1839 was a purser on a Mississippi steamer. He kept up his mechanical studies, and in 1842 invented a diving bell for the recovery of cargoes from sunken steamers. A company was organized for its use, and employed it for several years in saving wrecked goods. Thus young Eads acquired an intimate knowledge of the great river and of its action upon the silt beds that lie in its course. In 1845 he sold his interest in the company and established glass works in St. Louis, the first ever started west of the Ohio. Failing in this, he returned to the work of saving wreckage, and in this work and in improving the river channel at St. Louis he accumulated a fortune.

As long ago as 1856 he proposed to keep the channel of the Mississippi, Missouri, Ohio, and Arkansas Rivers clear, but Congress rejected the plans. His first great achievement was during the war. In 1861 President Lincoln asked him for designs for gunboats for the Western rivers. He offered the plans, which were accepted, and he undertook to build seven vessels in sixty-five days, and carried out the contract. Seventeen other boats were built by him during the war, and did good service under Farragut, at the capture of Mobile and elsewhere.

The great steel arch bridge at St. Louis, with a clear span of 564 feet, built by him, still represents a triumph of modern engineering. It was opened to traffic in 1874, after seven years had been consumed in building it. His next important work was the excavation of the Mississippi channel by the aid of jetties, which work he carried out in the face of the most determined opposition from other engineers. He deepened the South Pass from a depth of 8 ft. to 30 ft. by his plan of making the river scour its own channel.

His great project of the Tehuantepec ship railroad is still in embryo. Success marked his work always. He has left this enterprise in such an advanced phase that its consummation need only be a question of time.

He was the recipient in June, 1881, of the Albert medal of the British Society of Arts, he being the first American upon whom it was conferred. From the Missouri State University he obtained the degree of LL.D. In the same year he was received by the British Association at their York meeting, and made an address upon the improvements of the Mississippi channel, and upon the Tehuantepec ship railroad, which the society voted to print among its archives. A full account of his achievements would fill many pages. The above is a mere note of the more remarkable ones. In past numbers of the SCIENTIFIC AMERICAN and SUPPLEMENT, various accounts of his life and labors will be found.*

THE STATE TAX ON COMMERCIAL TRAVELERS UNCONSTITUTIONAL.

On March 7 an opinion was rendered by the Supreme Court of the United States in a case involving this tax. In Shelby County, Tenn., a special tax has been levied upon traveling salesmen engaged in soliciting orders. In amount it was quite onerous, being ten dollars per week or twenty-five dollars per month. It was collected not only from salesmen from other States, but also from those coming from other parts of Tennessee. This district includes the city of Memphis. The case is numbered 816. It is of special importance, because in the opinion of the court the doctrine of the regulation of inter-state commerce is considered at some length.

An unlicensed salesman had been arrested in Memphis, and had been convicted and fined, and on appeal to the highest State court the conviction had been affirmed. The case was then carried up to the Supreme Court of the United States. They have now reversed the decision of the Tennessee Supreme Court, and ordered the plaintiff in error to be discharged. The opinion was delivered by Chief Justice Bradley. Starting with the point that the power to regulate inter-state commerce is vested in Congress, the court holds that this power is exclusive whenever the subjects of it are national in character, and only admit of one uniform system or plan of regulation. The part of the Constitution on which this rests is the well known third clause of Section VII., the one under which protection is extended by the United States courts to trade marks.

From this premise it is held that a failure on the part of Congress to act in such cases indicates its will that the subject shall be left free from any restrictions or regulations imposed by the States, except as regards matters of local concern. Thus, by virtue of its police power and jurisdiction over persons and property within its boundaries, certain restrictions might incidentally be placed upon business transactions, but this would not justify any direct interference with inter-state commerce, nor the direct imposition of taxes upon temporary sojourners within the State, nor upon property not yet become part of the common mass, so as to discriminate against the citizens of other States. In the matter of inter-state commerce, the United States are, in the opinion of the court, but one country, and are, and must be, subject to one system of regulations, and not to a multitude of systems.

This is a brief abstract of the principles on which the decision was founded. The question of its expediency as affecting the resources of the State is considered at considerable length. Congress is pointed out as the proper power to pass laws to undo any injury which freedom of trade may do to the individual State. Based on the peculiar fact that Shelby County taxes commercial travelers from other parts of Tennessee as well as the outside class, a dissenting opinion was rendered by Justices Field and Gray, they holding that to relieve such travelers from other States from taxation would operate as a discrimination against those from other parts of Tennessee. Two wrongs do not make a right, however, and the State of Tennessee can easily, by proper legislation, remove this burden, if it is such, from residents outside of Shelby County. A further interest attaches to the decision, as it indicates a reaffirmation of the limits of State rights.

*See SCIENTIFIC AMERICAN, December 27, 1884, and SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 44 and 479.

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HENRY WARD BEECHER.

This great man—the most commanding genius of the present age—passed from the scene of human activities at Brooklyn, N. Y., on the 8th of March, 1887, in the 74th year of his life. He was born at Litchfield, Conn., in 1813. His talents were most versatile and extraordinary. What he was as a man, how his abilities were employed, and what he accomplished, is well condensed in the following resolutions of the Union League Club of New York:

"Inasmuch as it has pleased Almighty God to remove from the scenes of earth the Rev. Henry Ward Beecher, whose long, eventful, and distinguished life is known and recognized throughout the civilized world; be it, therefore,

"*Resolved*, That the Union League Club feels moved by the common sentiments of mourning which the occasion has universally called forth, and desires to add to the expression of other bodies its sense of appreciation of the great man who is now gone from us forever.

"*Resolved*, That in the person of Henry Ward Beecher we recognize, first of all, a great moral teacher, whose inspiration arose from an undying love of humanity and a belief in its worth and upward tendencies.

"*Resolved*, That his example as a liberal teacher, not only in secular and political affairs, but in religion also, has produced a marked effect upon the age, and has tended in the direction of leading men to a higher and better appreciation, not only of their earthly responsibilities and duties toward each other, but to a truer sense and knowledge of their relations to their Creator.

"*Resolved*, That the State and nation have, in the death of Mr. Beecher, lost a patriot whose love of country was always uppermost, and whose services in its behalf at a time and place of the most trying nature were equal to the great necessities at hand, and whose labors at that critical juncture were so peculiar, delicate, and effective that their value can never be overstated, as remembrance of them can never perish from the hearts of his grateful countrymen.

"*Resolved*, That we also recognize in Mr. Beecher a man of mighty intellect, lofty genius, marvelous fertility of thought, and unsurpassed in its expression, and that his contributions to the literature of the country will always retain the conspicuous place which his writings now occupy."

ASTRONOMICAL NOTES.

A Trio of Evening Stars.—The three planets Jupiter, Venus, and Saturn will be superb objects during the evenings of the latter part of March and the whole of April. We give Jupiter the first place, as his opposition with the sun occurs on April 21, this being his culminating point as seen from the earth. He then looms up in the east at sunset, looks down from the meridian at midnight, and sets at sunrise.

European astronomers have already seen this princely planet in full daylight with the naked eye. An observer at Argentan, France, followed the course of the planet from 7 o'clock till 10 o'clock on the morning of December 20, 1886, and on several succeeding mornings, and again on January 15 and 16, selecting the time when Jupiter was in or near conjunction with the moon, in order to know his exact position in the sky. The giant of the system in the full sunlight looked like a tiny shining point.

Observers with unusual visual power may now see the largest of the satellites with the unaided eye, and the whole four are visible in a marine glass.

Venus, in the western sky, worthily rivals her brother planet in the eastern sky. No planetary aspect is more charming than the one presented when the two most beautiful planets revealed to human view are found, the one rising with stately step in the east, while the other descends, serenely radiant, in the west. Venus is seen on the glowing twilight sky for more than two hours after sunset, and Jupiter, after opposition, will be her bright companion till she is lost to view, and then he reigns supreme among the starry throng till the morning dawns.

Saturn is the third member of the trio, but his brightness is on the wane, and before April closes he disappears from view before midnight. On April 1 he is on the meridian, about half-past 6 o'clock in the evening. He is still an interesting object as he descends in the west and approaches Venus, the two planets being near together on the evening of May 30. Saturn may be easily traced by his companions, Castor and Pollux on the north and Procyon on the south.

The Asteroids.—This unique planetary family is receiving constant accessions to its ranks. It now numbers 265 members. The latest comer was gathered in on February 25, by the indefatigable Palisa, and is of the twelfth magnitude. The later asteroids are not considered as very distinguished arrivals in the family. The older ones are more noteworthy in every respect. They are larger, they have the longest and the shortest periods, and their orbits are the most inclined or the most eccentric. One of them, Vesta, is now visible to the naked eye as a star of the sixth magnitude, about 10 degrees north of Jupiter. Those that are found now are of the twelfth and thirteenth magnitude. As telescopic power increases, an indefinite number of small asteroids may be discovered, but none of them will probably reach the tenth magnitude. The zone in which the asteroids travel is about as wide as three times the earth's distance from the sun. It is dangerously near to Jupiter, and absolutely encroaches upon the domain of Mars. It is said that Æthra, when in perihelion, gets inside of Mars in aphelion by as much as five million miles, though at so different a level in space that there is no close approach. The asteroids are troblesome members of the sun's family. They are hard to find, hard to keep when discovered. It is hard to trace their orbits and fix their places, and hardest of all to calculate their perturbations under the influence of Jupiter's mighty mass.

The Comets of 1887.—The present year rejoices in the discovery of four comets during the passage of the first two months.

Comet *a* was discovered on January 18, by Dr. Thorne, of the Cordoba Observatory. It promised to be a comet of renown, and closely resembled the great comet of 1880. Its tail was seen at Melbourne on January 21. As it passed perihelion on January 11, and its light is growing fainter, it will hardly merit a place among distinguished visitors.

Comet *b* was discovered on January 22, by Professor Brooks, of Phelps, N. Y. It was faint, moving slowly in a northwest direction, and was visible in a small telescope just below the North Star. Its ephemeris has been computed, and its elements show a singular resemblance to the comet of 1491, observed in China.

Comet *c* was discovered on January 23, by Prof. Barnard, of Nashville. It was faint, circular, with a nebulosity 1′ in diameter, had some central condensation, and was of the tenth magnitude.

Comet *d* was discovered by Prof. Barnard, on February 16. It was very faint, and moving rapidly in a northwesterly direction.

Eight comets passed perihelion during the year 1886. Prof. Brooks discovered three of them and Prof. Barnard two. Comets Fabry and Barnard were visible to the naked eye. One was Winnecke's comet on its periodic return, and two of the new ones, those of Finlay and the third one found by Brooks, were probably periodical.

Great numbers of telescopic comets, without doubt, are constantly flitting in our neighborhood, but they come and go without being perceived. Even those that are picked up by keen observers are, most of them, of little value, except as celestial curiosities, helping to swell the cometary records.

Weight of Dry and Moist Air.

N. S. C. writes: "In Cooley's New Natural Philosophy, page 54, I read: 'The atmospheric pressure will be greatest when there is the greatest amount of water vapor in the air; the barometer column will then rise.'

"In Kiddle's Physics, page 71, I am informed that: 'Watery vapor being lighter than air, the presence of large quantities of it reduces the pressure of the atmosphere.'

"When doctors disagree, who shall decide? Will the SCIENTIFIC AMERICAN please do it?"

A. Wet air is lighter than dry air. The general principles of the subject are enunciated in Dalton's laws, which may be thus expressed: 1. The tension (or pressure), and consequently the quantity of vapor (as of water vapor) that saturates a given space, is the same, whether that space was originally a vacuum or was filled with air or any other gas. 2. The tension (or pressure) of the mixture of a vapor and a gas is equal to the sum of the tensions (or pressures) which each would exert if filling that space alone. In studying these laws, it should be remembered that tension and pressure are synonymous for them, and that by Mariotte's and Boyle's law the volume of gases is inversely proportional to their tensions or pressures. Let us suppose now that we have two vessels filled, one with dry air and the other with air saturated with moisture. Assume the pressure or tension in each vessel to be 30 inches of mercury, and the temperature 60° Fah., and assume the volume of each vessel to be 600 cubic inches. The dry air will weigh $600 \times 0{\cdot}30935 = 185{\cdot}61$ grains. The tension of water vapor at the above temperature is about 0·5 inch. Therefore, by Dalton's second law, the 30 inches of tension or pressure in the vessel filled with wet air will be made up of that due to the water vapor, or 0·5 inch, and of that due to the air, or $30 - 0{\cdot}5 = 29{\cdot}5$ inches. Then by Mariotte's law the quantity of water vapor present in the vessel will be $\frac{600 \times 0{\cdot}5}{30}$ or 10 cubic inches, weighing about ⅝ as much as the same volume of air, or 1·93 grains. By Mariotte's law again, the volume of air alone present in the vessel will be $\frac{600 \times 29{\cdot}5}{30} = 590$ cubic inches, weighing 182·52. The contents of the second vessel, wet air, or air and water vapor, will weigh $1{\cdot}93 + 182{\cdot}52 = 184{\cdot}45$. The ratio of the weights of dry to wet air, therefore, at the above temperatures and pressures is 100 : 99·37.

Of course, even theoretically the above is not perfectly accurate, for Mariotte's and Boyle's law is only approximately true at ordinary temperatures. But if it is understood that moistening air merely means displacing a certain quantity of air and substituting therefor water vapor, and that such vapor is about ⅝ as heavy as a similar volume of air, there will be no difficulty in realizing that wet air is lighter than dry air.

Improved Gunpowder.

The charcoals hitherto used in the manufacture of gunpowder have been of comparatively low densities and inflammable natures, as well as highly hygroscopic. Mr. A. H. Durnford, of the Dartford Conservative Club, has, therefore, patented an invention, the object of which is to prepare a soft charcoal, which shall have an extremely light density, ignite at a low temperature, and exhibit very slight hygroscopic properties, and by its use in the manufacture of gunpowder to produce a gunpowder possessing the qualities of great energy and propelling power, combined with moderate pressures when fired in a gun. The invention consists chiefly in the production and use in gunpowder of a charcoal prepared from cork. The cork is put into cylinders and subjected to a destructive distillation by heating the cylinders to such temperatures as will produce the charcoal required. The improved gunpowder is made from mixtures consisting of, first, saltpeter and cork charcoal, in the proportions of about 80 and 20 per cent respectively; second, saltpeter, cork charcoal, and sulphur, the latter ingredient being in a proportion varying from about 1 to 10 per cent. It is claimed that the gunpowder produced by Mr. Durnford's process is comparatively smokeless and non-hygroscopic.

A Bomb Test.

A Washington dispatch says: "The inventor of a new kind of bomb, for which a patent is pending, came to see the Commissioner, who happened to be out. He brought with him a specimen bomb, which was inclosed in a pasteboard case, and he showed it to the Commissioner's private secretary, Mr. Will Montgomery. The inventor said that it would go off as soon as it touched water, and this specimen would make a noise when exploded like a fire cracker. The private secretary had some curiosity to see the bomb tested, and sent out and procured a pail of water. When the bomb was thrown into the water, the effect was startling. The water was forced up with violence to the ceiling, and fell in a shower pretty well all over the room, while the noise of the explosion was like the report of a cannon. As soon as the few spectators could wipe the water out of their eyes, they pronounced the test a great success."

A Great Balloon.

The captive balloon proposed by M. G. Yon for the French exhibition in 1889 will have the enormous volume of 60,000 cubic meters. The maximum altitude for the ascensions will be 1,000 meters, and it will be possible to take 100 passengers, a winding engine of 600 horse power being employed. In the construction of this balloon, the following point is of some interest: The surface of the balloon must always be tight, in order to prevent the damage which otherwise a strong wind might cause. To preserve tightness, notwithstanding variations in temperature, another small balloon is placed inside the large one, and the volume of this small balloon, which is filled with atmospheric air, can be increased or diminished by pumping in or exhausting air by means of an air pump, worked by an electric motor on the car, the current being supplied by a twin cable from a dynamo on the ground.

Death of A. J. Cambie.

Many readers of the SCIENTIFIC AMERICAN who have had business relations with the Canadian Patent Office will regret to hear of the death of its able chief clerk, Mr. A. J. Cambie, at Ottawa, on the 19th of February.

Mr. Cambie has acted as Deputy Commissioner of Patents for a number of years, and our extensive intercourse with the bureau over which he presided enables us to say that he was a most efficient and obliging officer. He proved himself to be a gentleman in all his dealings with those who had business to transact at the Patent Office.

GAS POWER.—The Gasmotoren Fabrik at Deutz have recently made a very successful trial of a double cylinder Otto engine, which gave a brake power of about 60 horse power when driven with Dowson's fuel gas. They are now making a four cylinder Otto engine which will not only develop over 100 horse power effective, but will have an impulse at every stroke. It will thus be seen that a considerable advance is being made in the sizes of gas engines now that Dowson's gas has been proved suitable for them, with a lower fuel consumption per horse power than is possible with steam engines of equal power.

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THE MORGUE AT PARIS.

The morgue has been much written about from an administrative and medical standpoint, but the improvements that have been made in its internal organization, and more especially in the mode of preserving the bodies, are but little known to the public. It is merely known that, by means of cold, it is possible to preserve therein, as long as desirable, the corpses that are exhibited for identification; but, as a general thing, it is not known how the cold is applied, and by what apparatus it is produced. This is what we are now going to explain, without entering into those details which, in a subject of this kind, might seem too repulsive to our readers. We shall merely mention, then, the Hall of Autopsy, with its table after the pattern of those used in the amphitheaters of hospitals. It is here that the eminent Dr. Brouardel delivers his lectures on medical jurisprudence.

All that we shall say of the Court of Justice is, that those who love these kinds of sensations can here read under the seats the names of the celebrated criminals who have sat in them, along with the dates at which they were arraigned, Among other names that we read here are those of Prevost, Moyaux, and Troppmann. We shall likewise pass over the registry and its dependencies, which, in the morgue, constitute a sort of mayoralty for arriving at the most important service—the identification of corpses through public exposure. The improvements introduced into this service were so much the more necessary in that the number of bodies annually exposed follows a progressively ascending scale. In the interesting statistics compiled by Dr. Devergie for the years 1836 to 1846, and since continued, we find these figures:

From 1836 to 1846	3,483	bodies or parts thereof.
" 1846 to 1856	4,236	"
" 1856 to 1866	5,367	"
" 1866 to 1876	7,091	"

Then come, for the six years following:

1876	614	bodies.
1877	629	"
1878	718	"
1879	710	"
1880	807	"
1881	920	"

Finally, the morgue is on the point of annually receiving 1,000 corpses whose identity needs to be established. Before making known the means employed for facilitating the recognition of these by the public, let us cast a rapid glance backward, and one which will allow us to appreciate the progress that has been made. The following is the description that is given us of the primitive morgue organized in 1604 in the jail of the Chatelet:

"It was a damp and dark place, an infectious room whence constantly escaped the most fetid emanations. The corpses, thrown one upon another, awaited the coming of relatives, lantern in hand, to identify them."

The morgue of the Grand Chatelet having been closed by a police ordinance of the 9th Thermidor, year XII., there was built upon the quay of Marche-Neuf, at the angle of St. Michel bridge, a structure having the form of a Greek tomb, which all Parisians will recall. This was the little morgue, into which great improvements were introduced. In 1864, this building was replaced by the present morgue, erected at the point of Notre Dame. This establishment is a unique one, and has no equivalent in any other country, the morgues of other states being located either on boats or in hospitals, and being but little frequented by the public.

The Paris morgue receives not only the corpses of the capital, but also those from Sevres, St. Cloud, and Meudon—localities dependent upon the prefecture of police. Upon their arrival, a detailed description of the bodies is entered in a register. Then an effort is made to ascertain whether this description does not agree with that of some one who has disappeared. After this an effort is made find out the cause of death. The traces of blows or violence are carefully noted. The marks on the linen, rags, clothing, the collar of a coat, the number of a watch, may, in the absence of other things fixing the identity, give valuable information. In case, as often happens, a suicide has desired to destroy every sign that might lead to his identity after death, his case is put into the hands of a special agent, who follows up the slightest clews, and makes in the case of the dead the same researches as the police would do to find a living man. Although the corpse's identity may be undiscovered, it is easy to know in most cases what its calling was. Trades are recognized by the callosity of the hands. The ridge on the index finger reveals the hair cutter, the tailor is known by his knees, the seamstress by her needle-pricked fingers, etc.

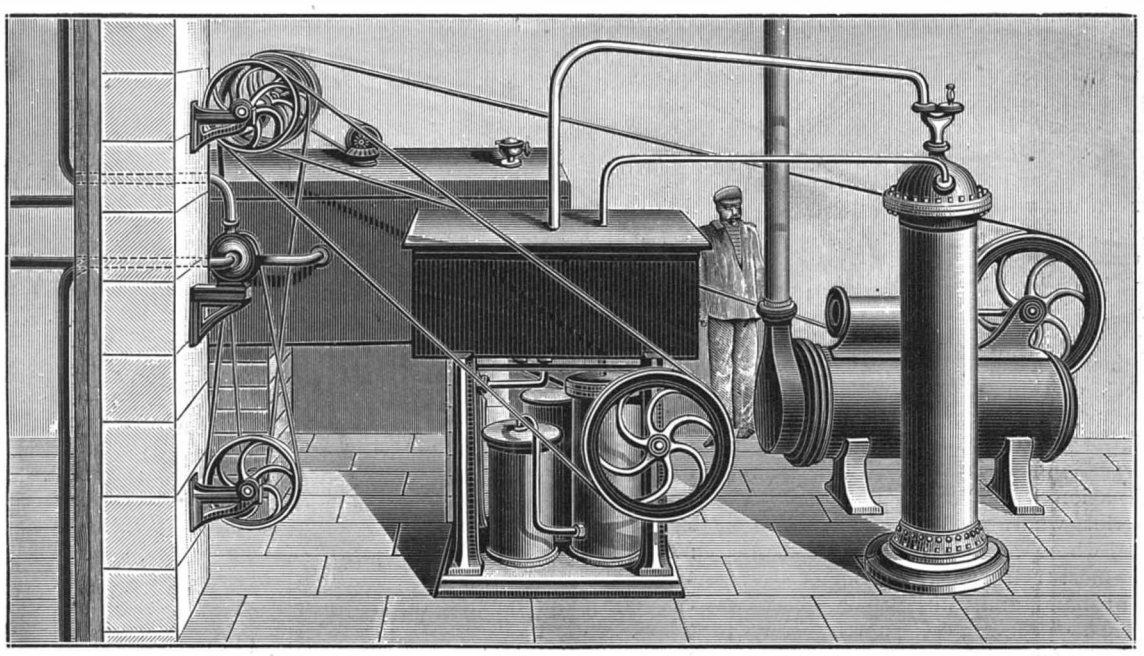

Fig. 1.—COLD AIR MACHINE OF THE PARIS MORGUE.

Before being placed on exhibition, the bodies are photographed. The photographs, which are placed before the eyes of the public upon the partition that hides the bodies from the gaze of passers-by on the street, are preserved for several years, and are capable of aiding in identification after burial.

Twelve black marble slabs are placed in the Exhibition Hall (Fig. 2). This latter is separated from the public by a glazed partition. The bodies are laid out upon these slabs, which slope toward the observer, and the head is raised by a support of special form so as to bring the face well into view. Until recent years, the bodies were shown in a nude state, and were partially covered by a metallic device, but at present they are exhibited with clothes on, thus rendering recognition easier. Moreover, the rules of decency being respected, access to the hall may be accorded to children, who have often been able to render great service in case of difficult recognitions. The clothes, which were formerly suspended from rods, and, after burial, kept before the eyes of the public, are now placed upon osier manikins which render the examination of them easier. As for the length of time that the cadavers were exposed, that was but a few days. It was possible to lengthen the time by but a few hours at the most, by sprinkling the bodies with cold water, or water and carbolic acid. No disinfectant had been found capable of successfully conquering the cadaveric smell, and the presence of venomous flies constituted a perpetual danger.

It is here that we see appear the study of a radical transformation commanded by hygiene and salubrity—the preservation of the corpses by cold. In 1880, on a vote of the Council General of the Seine, the Council of Public Hygiene and Salubrity named a committee which it charged with the duty of examining the various frigorific apparatus and the projects of setting them up proposed by various constructors. According to Dr. Brouardel, the following were the conditions under which the frigoric service was to be introduced into the morgue: (1) The bodies to be preserved were, at the moment of their arrival, to be submitted to a temperature of from —15° to —20°, and (2) then be carried into a hall whose temperature should oscillate between —4° and —1°.

The first condition is imposed by the slowness with which the human body cools, on account of its bad conductivity. Moreover, it results from Dr. Brouardel's researches that when the air is rapidly renewed around a frozen corpse, the skin becomes brown and parchment-like, thus rendering the identification of the individual more difficult. It therefore became necessary that the air surrounding the body should be quiet. Finally, the unstable subsoil of the morgue excluded every process that necessitated a steam engine of some size, and this singularly complicated the problem.

The committee immediately went to work and examined the shops and works in which were being constructed and operated the cold air apparatus that had been submitted to it, and which were capable of being grouped in three classes, viz.: The Giffard and Berger, the Tellier and the Pictet, and the Carre apparatus. The latter were adjudged to best meet the requirements of the case, and so to their constructors, Messrs. Mignon and Rouart, of Paris, was given the order for the entire machinery, which has been operating regularly for five years, and concerning which we shall give a few details.

The problem to be solved was that of keeping the Exhibition Hall beneath, but near, 0°, of cooling four bodies to a temperature of —15°, and of keeping ten bodies at a temperature of —2°. The first question to know was what should be the power of the cold air machine to be used. The constructors found that it would have to produce from ten to twelve thousand heat units per hour, and so adopted the machine known to the trade as the 220 pound one. This machine (shown in Fig. 1) is used for cocling the upper stratum of air in the Exhibition Hall. The colder air descends, while the warmer rises, and there is thus obtained a uniform temperature. This cooling of the air is effected by means of a cold solution of chloride of calcium falling in a shower upon a sort of roof (Fig. 2), and from thence flowing into a gutter that leads it to the refrigerator. Before reaching the upper part of the hall, the cold liquid has circulated through worms arranged at the sides of the compartments designed for cooling the four cadavers to —15°. Finally, before returning to the congealer to be cooled anew, the liquid circulates, through its own weight, in vertical worms that form partitions, and divide the chamber designed to cool ten cadavers to —2° into five compartments.

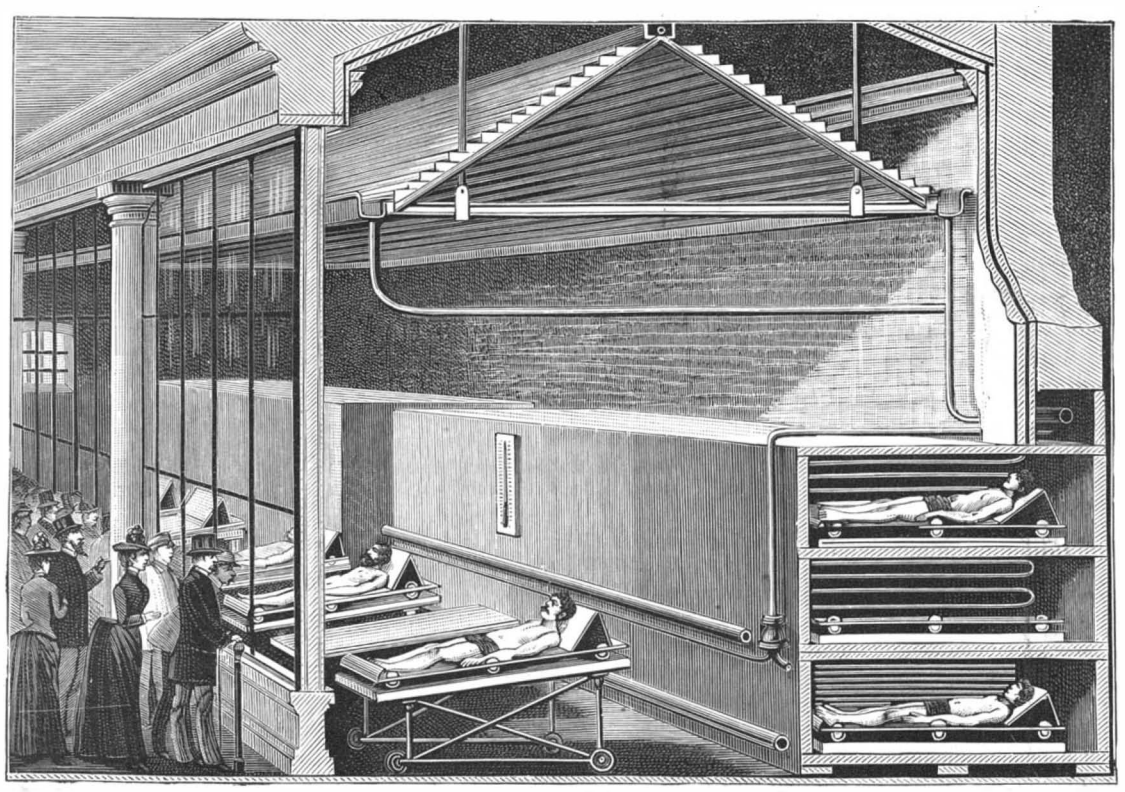

Fig. 2.—HALL OF THE PARIS MORGUE.

The circulation of the liquid is effected through a small centrifugal pump, run by a one horse power engine. The cost of putting in the apparatus was $8,800—a remarkably low figure.

Upon the whole, the advantages of the Carre apparatus are the following: It requires a very low motive power; it takes up but little room; it operates in silence, and gives a lower temperature than other

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machines do, and its performance is higher. Finally, its presence has not materially modified the interior arrangement of the morgue.

The question now remains to be answered, How long is it possible with this process to preserve bodies that have not been identified, or that are designed for an autopsy?

The length of time, as shown by the following figures, is, so to speak, indefinite. It has been found possible to preserve bodies that had been first congealed to —15° for six weeks in the Exhibition Hall, and that, too, without the necessity of putting them into the cases again. Just at present there may be

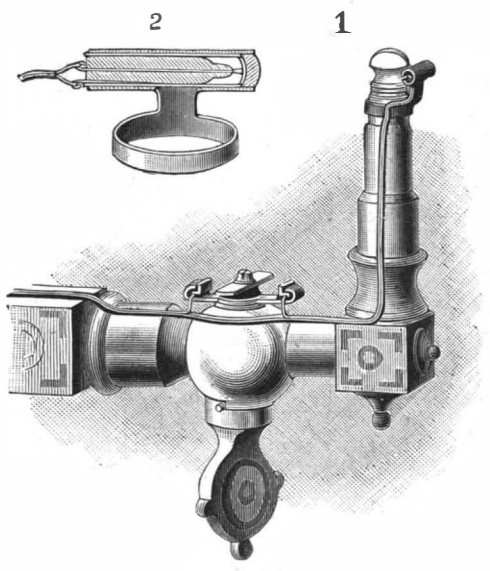
NIFENECKER'S ATTACHMENT FOR COOKING STOVES.

seen lying upon one of the slabs the body of a man who was hanged on the 2d of November last, and whose features have as yet undergone no alteration. In the Pel affair, some bodies treated in this way remained eight months at the disposal of the law. Finally, in a visit made by us to the morgue, we were enabled, thanks to the kindness of the register, Mr. Pierre, to examine the remains of a woman hacked to pieces and a victim of the Montrouge horror, whose author remains unknown. These remains, which were submitted to a temperature of —15° on their arrival (August 4, 1886), have undergone no alteration. They have the aspect of marble or wax, and the skin has become just the least bit brownish.

Owing to the important improvements that we have just described, the number of recognitions has perceptibly increased. Before the apparatus was put in, the average was 66·6 per cent, while now it is 90 and even 92 per cent. We have therefore reached the remarkable result of obtaining an identification of more than nine-tenths of the bodies exhibited.—*La Nature.*

ELECTRICAL GAS ALARM.

The object of the invention which we herewith illustrate is to provide a simple and efficient device for establishing an electric circuit when the gas flame is extinguished, and for breaking the circuit and holding it open while the gas is burning. To the burner, near the tip, is fitted a collar, provided with an arm carrying a



McVAY'S ELECTRICAL GAS ALARM.

split sleeve. To the sleeve, which is shown in section in Fig. 2, is fitted a brass tube having its closed end provided with a lining of aluminium or other unoxidable metal. To this tube is fitted a glass tube in which is sealed a platinum wire, which projects beyond the end of the glass and contacts with the lining when the brass tube is cold. Wires are connected with the platinum and the brass tube. To the smaller end of the gas cock is fitted a plate, projecting equally in opposite directions and arranged parallel with the thumb piece. To the bracket in which the cock is fitted is secured a plate, Fig. 1, the ends of which are turned over toward each other and bent down upon L-shaped pieces of platinum or copper, with an intervening insulation. These pieces project into the path of the plate, so that when the gas is turned on, the ends of the plate will touch the insulated pieces and establish an electrical connection between them through the plate. The electrical circuit is from the battery, through a wire to one of the angle pieces, the other angle piece being connected by a wire with the brass tube, and the platinum wire being connected by a wire with the bell and battery. When the gas is turned on, the electrical connection from the battery, through the bell, is established through the angle plates and platinum wire; but as soon as the gas is lighted and the brass tube heated, its rate of expansion being greater than that of the glass tube, it carries the aluminium lining away from the platinum wire and breaks the electrical connection. Should the gas be extinguished without turning the cock so as to break the circuit between the angle plates, the cooling down of the brass tube would bring the aluminium lining into contact with the platinum wire, and thus establish the electric circuit, which would cause the ringing of the alarm bell and attract attention to the burner.

This invention, which has been patented by Mr. William McVay, of 184 South 4th Street, Quincy, Ill., is especially adapted for use in hotels and boarding houses, where people unused to gas are liable to blow out the flame, leaving the gas turned on.

ATTACHMENT FOR COOKING STOVES.

This attachment is designed for the purpose of carrying off all vapors, odors, and smoke arising in boiling, broiling, and frying. The attachment consists of a hood closed at one end and provided at the other with a door, and of a bottom or grate secured to the hood. A flue is formed on the inside of the hood by a partition extending from end to end on one side of the hood. The grate is provided with two apertures, in which fit lugs attached to the bottom of the frying pan, the handle of which passes through a suitable opening in the door, when the latter is closed. In using the attachment, one or more of the covers are removed from the stove when the attachment is placed on the latter, so as to cover the holes. The frying pan containing the articles to be cooked is then placed on the grate, its lugs fitting in the apertures in the grate and holding it in position. The door is then swung downward and the hood closed. It will be seen that all the vapors arising from the cooking will flow into the flue in the cover, through the stove holes and thence to the chimney, so that no smell or smoke will be perceived in the apartment. The progress of the cooking can any time be observed by opening the door. The grate may be made without the apertures, and a frying pan of the usual form can be used, if desired.

This invention has been patented by Mr. Eugene Nifenecker. Particulars can be obtained from Mr. Henry A. Love, of West New Brighton, Staten Island, N. Y.

Impure Ice.

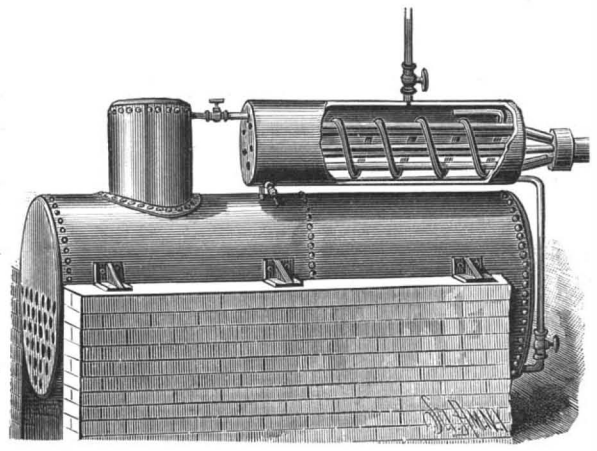
That ice does not purify impure water is a well known fact. In a report made by the State Board of Health of New York, on the purity of ice from Onondaga Lake, this is again conclusively proved. Into this lake is discharged the sewage of the city of Syracuse, amounting to 5,000,000 of gallons a day. At the time the inspection of this lake was made, there was a margin of from 1 to 4 ft. wide of black, putrefying organic matter along the shores. The analyses of the ice from this lake showed that it contained probably from 10 to 12 per cent of the sewage impurities dissolved in the same quantity of unfrozen water of the lake. This ice also showed the presence of bacteria in great abundance, retarded somewhat in their growth by the ice, but not destroyed by it. It is, perhaps, needless to say that this ice was pronounced totally unfit for any purposes where it is liable to come in contact with food or drink.

The report, valuable for what has already been mentioned, is still more so by reason of the numerous references to instances in which impure ice has been the cause of dysentery and other diseases. The earliest of these was that at Rye Beach, N. H., reported by Dr. A. H. Nichols, of Boston, in 1875, in which there broke out among the guests of a large hotel at that place an epidemic of gastro-enteritis, caused by impure ice from a filthy pond. Another instance of sickness caused by impure ice, referred to in the report, is that of an epidemic of dysentery which occurred in 1879 at Washington, Conn., investigated by Dr. Brown, of that place, and by Dr. Raymond, of Brooklyn. The ice had been gathered from a pond which had been used as a wallowing ground by the pigs. Other instances are quoted of the injurious effects of impure ice upon the public health, and sufficient evidence given to show that, in the process of freezing, water does not purify itself. The report, taken as a whole, is a very valuable contribution to this subject, and a complete refutation of the old idea that all ice must of necessity be pure.

FEED WATER HEATER.

A pipe leads from the steam dome of a boiler of the usual construction into a tank supported above the water level of the boiler. It is formed into a coil in the tank, and its end opens into the latter at the rear near the top. A pipe, opening into the tank a few inches above its bottom, is connected with the water space of the boiler. A water supply pipe connects with the tank, which is provided with a blow-out valve secured to the bottom. Each of the pipes is furnished with a valve, as shown in the engraving. Arranged longitudinally in the tank is a series of tubes, connected at one end with the exhaust pipe of the engine.

When the tank has been filled, or nearly filled, with water the supply pipe is closed and the steam admitted from the dome. The passage of the steam through the coiled pipe thoroughly heats the water. When it is



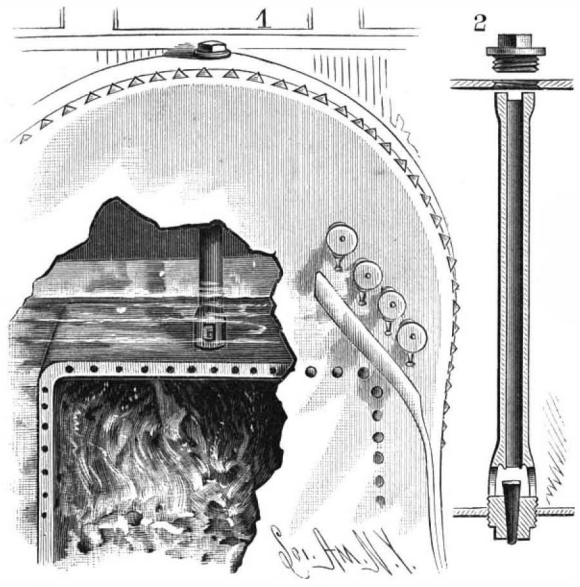
WHITNEY'S FEED WATER HEATER.

desired to charge the boiler, the lower valve is opened to permit the water to flow into the boiler. This empties the tank, when the valve in the pipes leading to the boiler are closed and the tank refilled with fresh water. The water in the tank is also heated by the exhaust steam passing through the longitudinal pipes. As the water in the tank is thus heated to nearly the same temperature as that in the boiler, all impurities will be deposited in the bottom of the tank, from which they can be removed by steam through the blow-off valve. When applied to locomotives, the tank is curved to rest on top of the boiler, and the water is discharged from both sides of the tank by two pipes.

This invention has been patented by Mr. Alexander E. J. Whitney, whose address is box 406, Leadville, Colorado.

DEVICE FOR PLACING FUSIBLE PLUGS IN BOILERS.

The object of this invention is to avoid the necessity of entering the fire box or the boiler for the purpose of inserting fusible metal plugs in the crown plate. Within the crown plate is formed a threaded aperture, in which fits a centrally apertured brass plug made integral with an upwardly extending tube, as shown in the sectional view, Fig. 2. In order to provide for the free circulation of the water about the top of the plug, the tube at its lower part is formed with side arms, between which are ports. The upper end of the tube is just below an opening in the upper portion of



GRUBE'S DEVICE FOR PLACING FUSIBLE PLUGS IN BOILERS.

the shell of the boiler, which is normally closed by a plug. This plug is removed when it is desired to insert a fusible plug, which is dropped through the tube into the aperture in the brass plug, after which it may be readily driven to place by means of a ramming rod inserted within the tube, as will be readily understood. The tube can be easily kept cleared of scale by passing a rod through it to the head of the fusible plug.

This invention has been patented by Mr. John A. Grube, of Beaver Creek, Ill., who will furnish any further information.

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The Chicago Manual Training School.

The Manual Training School is not conducted on a free principle. A tuition fee is charged for each student. With the exception of twenty pupils admitted this year, the fee is paid individually. These twenty were received upon recommendation of persons competent to judge of the merits of the boys, and their tuition is paid by members of the Commercial Club. Three years' study is necessary to complete the course. Of the seventy-two who entered the first junior class, twenty-seven remained to graduate. Ninety-eight entered the junior class last September. Four of this number have since dropped out. The boys who enter are from the ages of 14 to 15. None under 14 is admitted. No candidates are accepted who cannot pass a satisfactory examination in reading, writing, spelling, geography, English composition, and arithmetic. A boy must have, too, a certificate of good moral character from some responsible person. The penalty of any impropriety in conduct is dismissal. Latin, French, descriptive geometry, and higher algebra are taught. The first manual work a boy does when he begins the course is in the wood room. There he learns various branches of the carpenter's trade, joinery, wood turning, and pattern making. He learns not only the use of tools, but their proper care. Each boy furnishes his own kit and has his own tool drawer. Extra tools are supplied if needed, but the student is made responsible for them. Recently the boys were at work on picture frames, tables, hammer handles and the wood parts of other tools. In the second year the pupil is put in the foundry and blacksmith shop. No better hammers and screw drivers can be found in Chicago than are made by the lads. The most expert workman can turn out no smoother pieces of casting than some they show. In the senior year the students get into the machine shop. By that time they are able to make and put together a steam engine. Three were constructed in the school last year, and three will be made this.

The work of making an engine begins in the drawing room. Every stroke of the pencil is made by actual measurement, even to the drawing of a bolt head. The scholars draw the plans for the patterns, and then make the patterns. In the machine shop the busts of Stephenson, the engineer, and James Watt, begrimed with the soot of labor, look down upon the busy workers. The boys will soon try their skill in constructing an ornamental iron gate for the Michigan Avenue entrance of the building, for which drawings are now being made in the school.

The wood room contains thirty-nine cabinet makers' benches, twenty-four speed lathes, a circular saw, scroll saw, a boring machine, planer, grindstone, shoot plane, bench lathe, and general tools sufficient for the use of ninety-six boys. In the foundry are two furnaces, crucibles, troughs, flasks, trowels, rammers, sieves, and other apparatus, so that sixty-six boys can work at once. In the forge room they can get smut on their faces together, too, at the same time. There are twenty-four forges, twenty-three anvils, one emery wheel, one shears, three vises, one blower, two exhaust fans, tongs, sledges, hammers, fullers, and all the other tools required to transform clean skinned youths into the sootiest of blacksmiths.

The machine shop has seven 12 inch, 6 foot bed engine lathes. There is also an engine lathe with a 16 inch swing and 8 foot bed. There are two speed lathes, a planer with 6 foot bed, shaper, drill, grindstone, fifteen benches, fifteen vises, chucks, boring bars, taps, dies, chisels, files, and other tools—enough for thirty-two amateur machinists.

A visitor can pass through every room in the building and find no idlers. All are absorbed in the work they have in hand, and scarcely raise their eyes. "The fact that their attention is so riveted on what they are doing," said Mr. Belfield, "shows the cultivation of a most important faculty of the mind—the power of concentration. This attention, too, is not enforced, but is voluntary and unremitting. The boy who goes through a three years' course here not only attains intellectual development, but he gains comprehension of essential branches of knowledge far superior to those of the high school pupil. The training school is by no means a manufacturing establishment. The product of the school is not intended to be perfect pieces of machinery and polished furniture, but polished, perfect boys. It practically demonstrates, also, the dignity of labor. So thorough is the training here, that graduates who desire to pursue a higher grade of education are admitted, on recommendation of the director, without examination and free of conditions to several of the colleges and universities of mechanics and engineering in the United States.

"Prof. R. H. Thurston of Sibley College, Cornell University, wrote to me recently that if we could send him as good specimens of boy development as we have already forwarded, they'd be glad to get them. The professor of mechanical engineering at Perdue University, Lafayette, Ind., also wrote to me about one of our graduates who is there: 'If you can send us any more boys like this one,' he says, 'we shall be mighty glad to get them.' I believe we have struck the key note for the practical education of boys in the system of the Manual Training School. It embodies at once the education of the hand to skill and the brain to directive intelligence. There come the boys down to lunch. Their dining room is in the basement. They have made all the tables themselves."

ROBURITE—A NEW EXPLOSIVE.

A number of experiments were conducted lately at the works of Messrs. Heenan & Froude, Manchester, with a new explosive, called "roburite," which is manufactured in Germany, and is about to be introduced into this country for use in blasting operations. The composition and process of manufacture of this explosive are kept secret, but we understand that it consists of two non-explosive and perfectly harmless substances, of such a nature that they may be stored or transported without special precautions or restrictions. These two substances may be mixed together when required, and, in combination, become roburite, a yellowish compound, which will bear rough handling with safety. We understand that an intense heat is necessary to explode it. In order to prove this, the explosive was placed, in the experiments in question, between two plates, which were freely rubbed together and hammered; and a small quantity thrown upon a fire was merely consumed, without exploding.

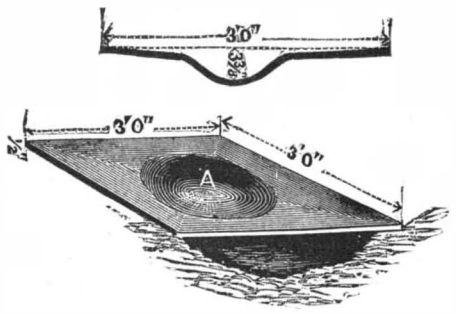

Fig. 1.

In order to obtain an idea of the explosive effectiveness of roburite, eight ounces of the explosive were placed on a plate of the very best steel, at the point marked A in Fig. 1, which shows the state of the plate after the explosion. This plate was 3 ft. square by ½ in. thick, and a bulge of about 1 ft. diam. and 3½ in. deep was caused by the explosion. Twelve ounces of the explosive were then placed at A (Fig. 2) on a cast iron plate, 6 in. thick, and weighing nearly three tons. After the explosion the plate was found to be broken transversely, in the manner shown in the engraving. Unlike dynamite, roburite is said to be in no way affected by varying temperatures, and if duly protected against damp, it may be kept for years in any climate, without its efficiency becoming in any way impaired. It is also claimed by the manufacturers that roburite has an explosive force greater than dynamite by at least 25 per cent.

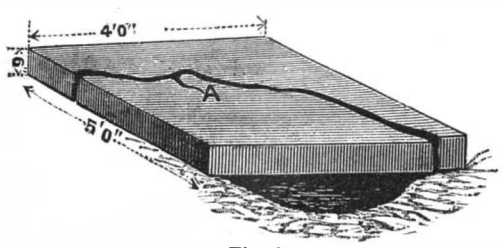

Fig. 2.

In exploding, roburite does not produce noxious gases, and, therefore, may be used without intermission, while the poisonous gases given off by dynamite often necessitate the stoppage of work, in some cases for a considerable time. This new explosive is applicable for use in mines and quarries, and for torpedoes and blasting operations generally.—*Industries.*

Connecticut Lava Beds.

The repeated earthquake shocks in the Western States, considered in connection with the destructively severe ones last August and September, make one wonder sometimes if Connecticut will always escape with as light a shaking up as it received when the city of Charleston was so nearly destroyed. But if there is no present danger from earthquakes and volcanic eruptions in Connecticut, the time is not so very distant, geologically speaking, when the city of Hartford, had it existed, would have been in danger of being flooded with lava. It was some time before the Connecticut Valley was peopled with red men, and about the time it was settled with red mud; it was when those great birds, thirty or forty feet high and weighing 800 to 1,000 pounds, were stalking about in the mud at Portland, that a great rent was made in the crust of the earth up and down the Connecticut Valley, and the streams of lava poured out. One of these fissures made its appearance within a few miles of Hartford, at Talcott Mountain, and the cooled lava now forms the solid foundation of that pleasant summer resort. Another outpour occurred near Meriden, and the cliffs there are what remains of this solidified ebullition after the glaciers have acted upon it. The east and west rocks of New Haven are the outcome of this same eruption, and just over the line Mount Tom and Mount Holyoke belong to the same family of fiery mountains, as also do the Palisades on the Hudson. It would appear that these lava eruptions in Connecticut were of comparatively short duration, and that the force that caused the earth to crack open up and down the valley in nearly a straight line suddenly ceased to act and the fissures closed up again. Great as must have been the forces exerted, and vast as must have been the amount of lava forced out, yet these mountains of melted rock here in Connecticut sink into insignificance when compared with a bed of lava in the northwestern part of this country. There the sheet of lava spreads out over the country from 2,000 to 4,000 feet thick. It covers not only the whole of Idaho, but most of Oregon and Washington Territory, and portions of Nevada, California, and Montana. Incredible as it almost seems, this great sheet, so many feet thick, spreads over an area of country nearly forty times as large as the whole State of Connecticut. All the Grand Army people who returned from California last fall, over the Northern Pacific Railroad, passed through a canon several thousand feet deep, worn through this frozen sea of lava by the Columbia River. Much as Connecticut has to boast of, in owning some of the first dry land that was ever created, and which has since never been covered by water, and settled and solid as it now appears, covered with a coating of snow and ice, still in comparatively modern times it was in a very unsettled condition and on the point of boiling over its borders.—*Hartford Evening Post.*

Chinese Journals in California.

Most of the Chinese dealers and business men of San Francisco, as well as their employes and agents, can read and write English, and a large number of them are subscribers to newspapers. In San Francisco there are four journals regularly published in Chinese characters. These appear weekly, and have a circulation of 2,500 copies.

It requires four persons to run a Chinese journal—an editor, a sub-editor, a translator, and a printer. The editor and sub-editor are usually the proprietors. The translator is the first and most important person. His duty is to collect news from the Chinese quarters, and to read the American dailies carefully. From these he takes the market quotations, new laws, and accounts of insults offered the Chinese, etc., and, in fact, everything that he thinks will interest his countrymen. He translates this news into Chinese, and gives it to the editors for insertion.

The editors take copies in Chinese characters, with the ordinary pen of their country, and with a peculiarly prepared ink, upon transfer paper. This latter is of the same dimensions as the sheet upon which the characters are to be printed. As soon as the editor has filled his sheet, he gives it to the printer, and his work is done.

According to the Chinese method, a good printer can print 400 sheets a day. Five days' work are required to get out an edition of 1,000 copies.

The journals are printed with black ink upon single sheets of white paper, except on the Chinese new year, when the printing is done with red ink or upon red paper.—*La Papeterie.*

A Locomotive Engineer, Lecturer, and Editor.

Mr. Angus Sinclair, editor of the *National Locomotive and Car Builder*, delivered a lecture recently at Cedar Rapids, Mich., before the employes connected with the Burlington, Cedar Rapids, and Northern shops. After referring to the attainment to the highest degree of perfection in an engine by effecting the transportation of steam into work, the speaker continued by saying that the great object sought was to make an engine which used the least steam and required the least repair. The locomotive engine, while it is imperfect in its economic use of steam, yet compares favorably with other engines. He spoke at some length of the great difficulties of getting the motive power economically out of coal. Electricity has of late years been forced to the front as a motive power, although it is not itself a prime motor like the locomotive, wind and water wheel, gas and hot air engines. Electricity must first be developed by the use of an engine and dynamo. At present, we are compelled to use coal to develop steam with which to move the engine by which the dynamo is driven. About fifty per cent of the motive power of steam is consumed in the transmission to the dynamo, and thus is seen the great waste of steam in the production of electricity. If electricity could be generated without the great expense of steam, as now required, a great saving would result; but under the present process, but little more than five per cent of the coal used in our furnaces is now put to work and utilized in the moving of machinery. Thus it will be seen that the great aim in the manufacture and management of engines is to get the largest percentage of the coal converted into working power.

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Correspondence.

The Government Surplus.

To the Editor of the Scientific American:

It seems that Congress does not know what to do with the large amount of money now belonging to our government. I suggest the passing of an act to give one million of dollars annually, by lot, to one thousand *inventors*, allowing $1,000 to each inventor, among all those who have received letters patent. There are several thousand inventors, and nothing would be more beneficial to progress and to the advancement of science than such a gift, and it would go to a deserving and needy class of people. The effect of such a gift would soon be apparent, and place the United States far in the lead of all other governments.

F. M. SHIELDS.

Coopwood, Miss., February 12, 1887.

The Aurora Borealis.

To the Editor of the Scientific American:

In your issue of February 26 you describe (Fig. 1) a magnificent example of an aurora borealis which was observed near the coast of Norway on the 18th day of October, 1868. I simply desire to say that this aurora was visible also from the United States, although I have never seen an account of it before. I witnessed it in company with a number of fellow students from the campus of Dickinson College, at Carlisle, Pa. The phenomenon occurred about midnight, and lasted only a few minutes, as indicated in your published description. It was a most sublime spectacle, and to the susceptible imagination of young college students it served the purpose of a moral lesson, for although out on a lark, I believe we all went straightway to bed, not forgetting on this occasion to say our prayers. EDWARD W. BYRN.

Washington, D. C., February 28, 1887.

Prince Rupert's Tears—Observations of a Glass Maker.

To the Editor of the Scientific American:

In a recent issue of your paper mention was made of drops of glass called "Prince Rupert drops," and how, upon being hit upon the small end, the entire piece would fly into small fragments. I have worked in a glass house for several years, and have seen them so large that when broken one would make a large sized handful. I have also seen them in the shape of long threads (this happens more frequently) which would snap upon being bent. By grasping one of these elongated ones near the end and placing the long end against my clothes, and then bending the short end, it would only break as far as the middle of my hand, and in this way I have taken a water cracker, as they are called in the factory, several feet long, and broken it four or five times. You also explained how a flask may be broken by shaking a crystal in it. This explained to me what caused an untempered bottle to burst. Any bottle which has not been tempered, and has a heavy bottom, will burst upon dropping another piece of glass into it, and then shaking it. JAMES WILLIAMS.

Sharpsburg, February 5, 1887.

A Suggestion for Precipitating Rainfall.

To the Editor of the Scientific American:

In the coffee plantations in this district it is very important for us to get our blossoming showers about the end of the month of March. About that time, thunder clouds are abundant, but very frequently they blow away from us, and fall on the dense groups of jungles by which we are surrounded, and are of no value to anybody, when, if they fell on the plantations, they would be of immense importance.

It has occurred to me that if I was to get some large size fire balloons, and send them up into the clouds when they were about, with, say, a pound of dynamite done up in a light package, and attached to the balloon by a string, the explosion might do something toward bringing on the rain. Can you give me any opinion on this subject, and any recommendations as to procedure?

I believe that it is a well established fact that if there are any rain clouds about at all, it always rains after an artillery engagement.

W. MAXWELL MAYNARD.

Hitlow, Koppa, Mysore, India.

[We think the above suggestion worthy of trial. The efficacy of artillery discharges in producing rainfalls has never been satisfactorily determined.]

Sawdust Explosions.

To the Editor of the Scientific American:

Some experiments I made about eight years ago to test this point may be of interest. I placed shingles in a sash and door factory where a sandpaper machine was working. In a very short time they were coated with dust to the depth of an inch. This dust was so wet that, when squeezed in the hand, water would run out. I then carried the shingle to my office, where a bright fire was burning, and used a small hand bellows to blow the dust off the shingle so as to come in direct contact with the flame, and the result was an undoubted explosion, of such a force as sufficed to blow the mica lights out of their places in the stove. The result of the few tests I made demonstrated this fact: that if a *flame* is brought into contact with finely disseminated dust, such as is found in flour mills, sash and door factories, and other works of like nature, an explosion will take place of such violence that no building could withstand it. The factory wherein my experiments were conducted immediately adopted blowers and exhaust fans for the entire removal of all the dust from the building, and this is the only safe way of dealing with this problem. M. J. BUTLER.

Napanee, January 27, 1887.

When Wood Dust Does not Explode.

To the Editor of the Scientific American:

Since a gas explosion in the smoke of smoldering fuel in a boiler furnace occurred recently, demolishing a building and sending flame into a shavings room, and because somebody said that "minute wood dust drew into the ash pit and caused a violent explosion," some folks seem inclined to believe the notion that wood dust is explosive.

The old buildings in Mechanics' Row, in this place, recently torn down, contained a planing mill and several large rooms, which were used in manufacturing doors, sashes, and blinds. Water power drove the machinery. We had no steam boiler and no room for exhausting fans and their pipes, and a more prolific place for the accumulation of wood dust could not be found.

Five very large stoves with openings in their tops did the heating. The rooms being "low posted," when we dumped shavings and sawdust into the stoves, a flame would often flash up, sending a shower of sparks to the floor above, but the wood dust clinging everywhere never took fire. The stoves and their funnels were frequently red hot. We became so accustomed to "this sort of thing" for thirty years, that the thought of exploding the wood dust never occurred to us.

WM. W. HUBBARD.

Manchester, N. H., February 22, 1887.

Taking Cold—a War Experience.

To the Editor of the Scientific American:

Let me relate my experience. I served three years in the 13th Mass. Regt. I was a delicate young man with a consumptive tendency. When our regiment was on its way to the front, our captain singled out, as I subsequently learned, two men (robust, hearty fellows) whom he thought would survive the hardships of war, and two more (I was one of them) who would not do so. As it happened, both the hearty fellows succumbed to the hardships of the service and died—and I live. The fourth man was taken down with chronic diarrhœa, and died on the way home. Naturally enough, sleeping on the damp ground soon brought on a cough. I was sent to the hospital; subsequently returned to the regiment, still sick, and spent the winter with it in close board huts, at Williamsport, Md. I was excused from all duty, except to turn out at the evening dress parade. My officers wanted me to accept a discharge and go home; had I done so, I verily believe I should have died. When the army, in obedience to Lincoln's orders, moved across the Potomac in the early spring of 1862, I was left behind as too weak to "keep up with the procession." A little squad of us feeble ones followed, as best we could, in the wake of the forces, sleeping at night in sheds, under hay stacks, or wherever and however night found us. Singularly enough, with each day of "roughing it" I gathered new strength, and within a week I was able to take my place in the ranks, and from that time forth I *couldn't* take cold, no matter how much I was chilled, or soaked, or frozen. I have often thought of it since, and believe that if one spends *all* his time in the open air, he cannot catch cold; it is alternating in doors and out that makes all the trouble. The second winter we spent half burrowed in the sands of Stafford County, Va., with shelter-tent roofs to our "dugouts." The third winter, at Mitchell's Station, we lived in diminutive log huts with the same kind of roofs. In both cases the ventilation was perfect. I remember entering one day an ordinary house, and the sense of suffocation was so great that I could not stay there. Arctic explorers, I believe, relate the same experience. My advice, therefore, to those consumptively inclined is to go out to the woods and plains, and live "near to nature's heart," if they wish a radical cure. B. SPOONER.

Dorchester, Mass., February 19, 1887.

A New Explosive Mixture.

A. Cavazzi (*Gazzetta Chimica Italiana*), in studying the reduction of potassium nitrate by various substances, has found that a mixture of equal parts of the nitrate and sodium hypophosphite detonates violently when heated to about the fusing point of the mixture. The experiment should be made on small quantities only, and while other proportions yield an explosive mixture, those mentioned are the best.

How Pure Butter and Cheese are Sophisticated.

The report of Prof. H. A. Weber to the Ohio Dairy and Food Commission, which has just been made, strikes hard at the boasted purity of so-called natural butter, and shows to what an alarming extent adulteration, simulation, and extension are caused by the butter, cheese, and milk producers.

Prof. Weber says almost every article of food that is offered for sale is adulterated, and very often in a manner that is injurious to health. Butter is adulterated with too much water and salt. The coloring matter that is generally used consists of annatto, a harmless coloring substance, also turmeric, saffron, marigold, and carrots. Of the mineral coloring matter said to have been found in butter may be mentioned chrosin yellow, a compound of lead and yellow coal tar colors, Victoria yellow, and Mastin's yellow. The detection of these coloring substances requires the best chemical skill.

Of cheese, the Professor states that it may be adulterated by the use of normal coloring matter, as red lead and Venetian red; the addition of sandy matters, as potatoes and bean meal; the substitution of foreign fats, as oleo and lard, in place of butter fat, removed by skimming the milk. The following analyses are given by him as illustrating this point. The first analysis of pure cream cheese manufactured by B. B. Herrick, Wellington, Ohio, in 100 parts:

Water	35·42
Ash	2·47
Fat	34·66
Caseine, sugar, etc.	30·45
	103 00

Analysis of skim milk cheese, known as Chicago Firsts, in 100 parts:

Water	52·73
Ash	2·69
Fat	2·63
Caseine, sugar, etc.	41·95
	100·00

The most common adulteration of milk is water. In order to hide the effect of the water, other substances, such as molasses, sugar, and salt, to correct the taste; and chalk, starch, cerebral matter, annatto, turmeric, gum dextrine, etc., to correct the appearance.

Metric Table.

The *Popular Science News* gives a table of the equivalents of both the common and metric systems together, as follows:

Length.

Unit of measurement.	Approximate equivalent.	Accurate equivalent.
1 inch	2½ cubic centimeters	2·539
1 centimeter ($\frac{1}{100}$ meter)	0·4 inch	0·393
1 yard	1 meter	0·914
1 meter (39·37 inches)	1 yard	1·093
1 foot	30 centimeters	30·479
1 kilometer (1,000 meters)	⅝ mile	0·621
1 mile	1⅝ kilometers	1·609

Weight.

1 gramme	15½ grains	15·432
1 grain	0·064 gramme	0·064
1 kilogramme (1,000 grms.)	2¼ pounds avoirdupois	2·204
1 pound avoirdupois	½ kilogramme	0·453
1 ounce avoirdupois (437½ grains)	28⅓ grammes	28·349
1 ounce troy or apothecary (480 grains)	31 grammes	31·103

Bulk.

1 cubic centimeter	0·06 cubic inch	0·061
1 cubic inch	16⅓ cubic centimeters	16·986
1 liter (1,000 cubic centimeters)	1 U. S. standard quart	0·946
1 United States quart	1 liter	1·057
1 fluid ounce	29½ cubic centimeters	29·570

Surface.

1 hectare (10,000 sq. meters)	2½ acres	2·471
1 acre	⅔ hectare	0·404

Soda Stoves for Heating Cars.

A good idea reaches us from a correspondent. The fireless soda locomotive of Honigman, described in our SUPPLEMENT, No. 483, has suggested to him the application of the same device to heating cars. The soda engine is based on the affinity of caustic soda for water. By arranging a reservoir of very strong soda solution so as to receive the exhaust of an engine, a source of heat is at once supplied, dependent on the chemical reaction, if it can be called such, between soda and water. As the steam meets the solution, it increases its temperature to an exceedingly high degree. In the Honigman engine, this reservoir of soda solution represents the furnace of an ordinary boiler, and is surrounded with a boiler in which steam is generated. Were soda stoves constructed for use on railroads, some of the exhaust steam would be required to keep up the heat. A small quantity injected into the stove would be ample. The stove might be provided with hot water circulating apparatus with steam radiating pipes, or might even be used as a heater directly. The soda solution would have to be boiled down to a proper strength at intervals. It seems as if there were a good chance for invention in this direction. It would meet the objection made to using steam, of the insufficiency of the available supply for long trains.

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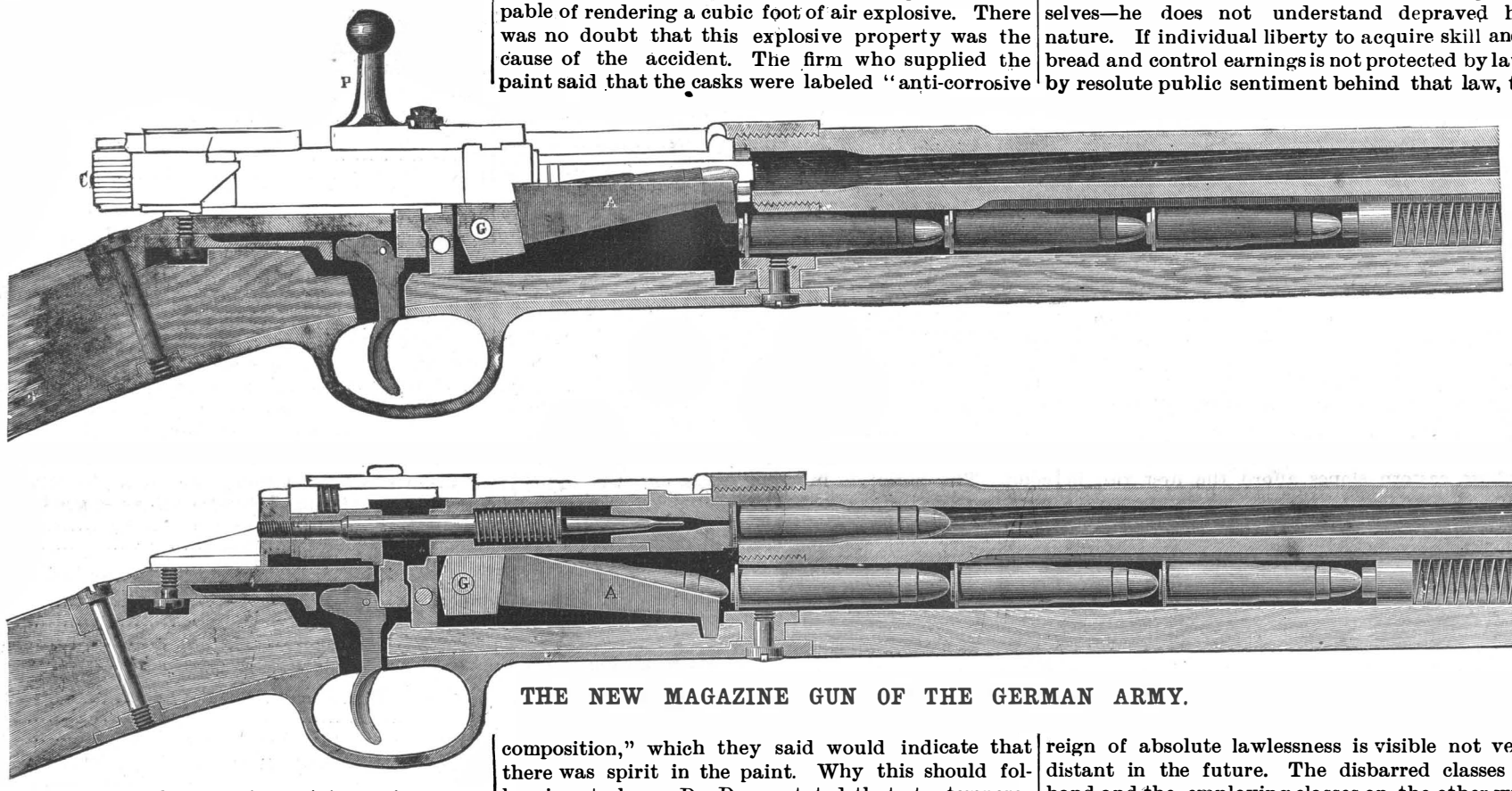
THE GERMAN ARMY MAGAZINE GUN.

The new magazine gun with which the German army will shortly be entirely provided is known as the M. 71–84 gun. It is the Mauser gun of the model of 1871, with the addition of a repeating mechanism which was definitely adopted in 1884, as the result of studies carried on simultaneously at the German military school and at the firearm manufactory at Spandau. The system for closing the breech is that of Mauser of 1871. The breech is seen to open at the side, like the Gras gun, and the pin hammer, formed of a metallic spindle, is pushed forward by a spring. Two important improvements have been made. The trigger is continuous in its action, which favors the conditions for accurate aiming, and the extractor automatically throws out the empty shell after discharge, while formerly it was necessary to withdraw it from the breech by hand.

The method of operation of the repeating mechanism is clearly shown in the accompanying illustrations. The magazine chamber is bored in the wood under the barrel. The cartridges are inserted therein, end to end, behind a spiral spring, which pushes them toward the rear, into a receiver or socket, which is pivoted on the axis, G, and which is represented in one of the pictures as dropped to receive the cartridge coming from the magazine, while in the other figure it is shown as raised, to bring the cartridge to the opening of the barrel, into which it will pass by the forward movement of the movable breech, which



THE NEW MAGAZINE GUN OF THE GERMAN ARMY.

drops the socket at the same instant to receive a new cartridge.

The action of the socket is regulated by a spring which tends to tip it up, but its action may be stopped by means of a little lever which extends through to the outside, at the left side of the arm. When the lever is inclined toward the butt; the repeating mechanism operates as described above, but if it is left vertical, the socket is thrown out of action, and the gun must be loaded by hand, with a single cartridge at a time.

The new arm is ordinarily to be used under the last named conditions, as the Germans do not consider rapid fire necessary except under special circumstances, as in the service of advance posts, or when it is necessary to repel an attack of cavalry at close range. To this end, the magazine should always be filled at the beginning of an action, but should not be used until the critical moment arrives. The magazine contains eight cartridges. With one in the socket and one in the breech, the new gun can be discharged ten times, without being newly charged, in 20 or 30 seconds.

The number of reserve charges is, therefore, less than the Colt gun (15 shots), or than the Suisse Vetterli (13 shots), but the number is thus reduced to obviate the inconvenience which arises from the inaccuracy of fire if the center of gravity is thrown too far forward by a long magazine.

The Mauser gun, 71–84, with its bayonet, is 70 inches in length, and weighs when empty about 12½ pounds. The official notice from which this information is derived fixes its range at about 650 feet on a single foot soldier, at a quarter of a mile on an object the size of a section of infantry, and at three-eighths of a mile for a still larger body of troops.—*L'Illustration.*

HOLD your breath and contract your abdominal muscles is the remedy for sea-sickness suggested by an English physician, Dr. E. P. Thurstan, who speaks from experience.

Dangerous Paints and Compositions.

There is much in a name when it enables manufacturers to send by rail and by sea a dangerous compound identified by some title which appears to belong to a harmless composition. Judging, however, by the evidence taken during the official inquiry into a serious explosion on board the Thorndale, of Sunderland, by which one man was killed and two seriously injured, on September 23, 1886, while on a voyage from Sunderland to the port of Galveston, this is a common practice. Mr. Danckwertz, in stating the case for the inquiry, said that before leaving, the Thorndale took on board three casks of "anti-corrosive paint," each containing about twelve gallons, and stowed under the forecastle. The casks bore no notice of any kind as to any special caution being necessary in dealing with the paint. When clear of the Channel, the day watch was set to work to paint the interior of the vessel. While the men were engaged in pouring out the paint by the light of a candle, about four feet from the casks, a serious explosion occurred, which knocked down the men standing round. The boatswain, who held the candle, had his clothes set on fire and was much burned, and two others similarly had their clothes set on fire, one being so much injured that he died the next day.

This anti-corrosive paint contained among other things "coal tar naphtha," and Dr. Dupre proved that by analysis the volatile hydrocarbons constituted some 2 per cent of the mixture. The result of the analysis seemed to be that one cubic inch of the paint was capable of rendering a cubic foot of air explosive. There was no doubt that this explosive property was the cause of the accident. The firm who supplied the paint said that the casks were labeled "anti-corrosive composition," which they said would indicate that there was spirit in the paint. Why this should follow is not clear. Dr. Dupre stated that at a temperature as low as 60° Fah. to 65° Fah., one cubic inch of it was sufficient to render one cubic foot of air explosive, and that under a higher temperature it would give off a much larger quantity; that under the circumstances under which this paint was being poured from one cask to another, the production of gas from it would be much increased; and that the quantity of paint poured out on the occasion in question was probably sufficient to render from 2,000 cubic feet to 3,000 cubic feet of air explosive. "Unless," said the Wreck Commissioner, "there was an order issued by the Privy Council that a notice should be placed on all similar compositions, it was doubtful if makers would do it, though with such dangerous compounds they would incur grave responsibility."

Numerous accidents and serious have occurred from similar causes, and the important issues at stake render legislative action urgently requisite, as, whether stored in railway sheds or trucks, in docks, in the storerooms or holds of ships, so low an explosive temperature as 60° renders this kind of material more dangerous than gunpowder or dynamite, and it is surely time that it should be placed under proper restrictions in its manufacture, storage, and carriage, so as to minimize as far as possible the great risks due to this new element of destruction to life and property alike. If makers were responsible for the results of these occurrences, they would probably soon find a material for making these quick-drying compositions without volatile spirits. It is lamentable that men should be blown up and killed or seriously maimed and no responsibility be incurred by the person supplying or making the compound, without clearly stating its nature and explosive character. It appears that there are many makers of these paints and compositions for the insides and outsides of ships, and that all, or nearly all, contain a notable percentage of these very highly volatile hydrocarbons. It further appears that neither railway companies nor ship owners have knowledge of the possibly dangerous nature of these paints or compositions. If they had, they would certainly carry them under special conditions and by special means, and ship owners would be careful of the way in which they stored materials which might give off a gas which, if fired in some parts of the ship, might send her to the bottom in the most innocent and unexplainable way.—*The Engineer.*

Something Else Coming.

According to the *Interior*, another moral question is coming into politics, which will undoubtedly raise a pretty stiff breeze of moral indignation. Says the *Interior:*

"A father might to-day tramp all over Chicago with a son who wanted to learn an honest trade, so as to become a useful citizen, and fail, unless he took him to the Manual Training School and paid tuition for him. Hundreds of boys are now thus taught handicraft at the expense of fathers who can afford to pay for it. But let a poor man's son try it, and he will be met at the door of the factory or shop by a walking delegate of the Knights of Labor, and turned away. If that does not do, his young face will be bruised by brutal fists, and so will the faces of those who stand by him. If any one supposes that there is any limit to this kind of opposition—any point at which the would-be monopolists of labor would draw the line of limitation upon themselves—he does not understand depraved human nature. If individual liberty to acquire skill and earn bread and control earnings is not protected by law, and by resolute public sentiment behind that law, then a reign of absolute lawlessness is visible not very far distant in the future. The disbarred classes on one hand and the employing classes on the other will join hands, and fight for their rights. The violence will not very long be all upon one side, and the violence which has human liberty and rights back of it will win. We are always glad to see a tyrannical and heartless employer forced to do right by "organized labor," but when organized labor determines to rob the American boy of his birthright, then it is evoking moral and material forces against itself which will not fail to beat it to pieces.

Endurance of Railroad Ties.

The supply of railroad ties is a matter of growing importance for the New England farmer, and certain experiments made at the suggestion of Professor Sargent by the Boston and Providence Railroad have an important bearing on it. Fifty-two ties were laid in December, 1878, on a track in Boston where the traffic is very heavy, having an average of sixty-five trains daily. Ten kinds of wood were tried, five in the natural state and five creosoted. None of the ties rotted, except one of the ailantus; the others that had to be removed had been injured by the hammering of the trains. Spruce, hemlock, larch, and Southern pine have all suffered badly in this way. White oak lasted well, but it holds the spikes so firmly that they cannot be drawn when the rails have to be shifted. Creosoted elm and birch did well, and are to be recommended. Chestnut was, unfortunately, not included in the experiment, although it is considered one of the best woods for ties. The behavior of the catalpa was one of the most interesting features of the case; it has been highly spoken of for ties on account of its practical indestructibility when placed in the soil, and all the ties of this wood here tried are still sound, exeept just under the rails, where they are crushed nearly to pulp, so as to be of no service whatever for roads of heavy traffic.—*Science.*

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Furnace Heating.

Mr. F. Siemens has for the past few weeks been conducting, in the pages of *Engineering*, a correspondence with Mr. Crowe, Mr. B. H. Thwaite, and others, upon dissociation in furnaces and the advantages of heating by radiation from flame, or toasting, as compared with heating by direct flame contact, or burning. The point which seems to be at issue in this controversy is the temperature at which dissociation of carbon gases begins to make itself evident by affecting practical results. Mr. Siemens holds that if flames are prevented from contact with the surfaces which inclose or direct their course, dissociation will not appear below an extraordinarily high temperature, which has not been accurately determined; and that all experiments tending to show an effect similar to what may be expected from genuine dissociation at comparatively low temperatures are vitiated by the action of the surfaces—an effect which has only been recognized during recent years.

With regard to heating by radiation, Mr. Siemens declares that in all cases where large furnace chambers are required to be intensely heated, a highly luminous flame, without contact, is necessary. Under such conditions of heating, the furnace will work economically at a high temperature, and will last a long time without repairs. Mr. Siemens cites an instance of open-hearth steel furnaces which have not been stopped for repairs for upward of twelve months.

In another communication, Mr. Siemens admits that it is difficult for persons accustomed to heat by contact to realize that their operations can be carried out quite as well, and even better, by radiation. He states that the development of this new method of heating was the result of much time and consideration given to the subject; and he does not expect that others will readily accept his views. It is an interesting development of this principle of heating that by it creosote and other kinds of liquid fuel, as well as gas, can be used for purposes for which, according to the ordinary plan, they are altogether unsuited. Only by preserving the flames of these fuels from contact with any surface until the operation of combustion is accomplished can they be made to give all their useful effect without smoking or cutting the materials of the furnace.—*Journal of Gas Lighting.*

SUBURBAN HOUSE OF A NEW YORK ARTIST.

Many New Yorkers have built for themselves beautiful summer residences on the Orange Hills of New Jersey, whose eastern slopes afford the first rise in ground met with on leaving the city in a southwesterly direction. The city is still within the horizon of view, the Bartholdi beacon at night, and the main physical features by day, being plainly discernible, but the distance is sufficiently great from the din and moil of the metropolis to give one a sense of rest, while renewing the tone and elasticity of the system as only the pure air of the country can effectually do.

Among those who have built for themselves homes which add to the naturally tranquil beauty of this locality, which is year by year becoming more desirable as the city grows, is Mr. Harry Fenn, the well-known artist, whose drawings are seen in some of the best work which has appeared in our illustrated magazines, and whose cottage at Montclair is represented in the accompanying illustrations.

The building is of wood, having, as will be seen, two main stories and a roomy attic, and the two views given show a picturesque effect, which well fits into and harmonizes with the immediate surroundings, while an inspection of the ground plan shows that this beauty of outward appearance is attained without any sacrifice of economy and convenience in the internal arrangement, such happy disposition being made of the space that all of the room is available, and the best views are obtained from every side. The principal entrance is by the porch, whose roof makes one continued curve with the gable which crowns the projection containing the stairs, with which it communicates, and from the vestibule is an entrance to a large square hall, shown in one of the views, which gives immediate entrance to parlor and dining-room, piazza and staircase, and forms the central portion of the ground plan. The roof above the hall rises higher than that of any other portion of the building, and the turret-like cap of the two-storied piazza is an adjunct of it, the attic under the roof being used by the artist as a studio.

MR. HARRY FENN'S COTTAGE, MONTCLAIR, N. J.

Exteriorly, the woodwork of the cottage is painted a dark brown, but this, and the gray plaster of the basement, will eventually be much changed in appearance by the growth of vines and plants, the green of which will make an agreeable contrast with the brown and gray of the building. For the interior, the wainscoting of the hall, its ceiling, and the woodwork of the stairs, are of Georgia pine, varnished to a golden hue. The wall above the wainscoting is a cream tint, with paneling of yellowish matting, but in the dining-room the wall above the wainscoting is painted a light salmon color. The parlor is in warm grays, and the upper rooms are all in light golden yellow tones, each having particular individual effects, but all harmonizing with one general idea, after the plan of the architect, Mr. Ficken, to which Mr. Fenn has contributed by his arrangements of bric-a-brac, draperies of doors and windows, etc.

The entablature bearing the date of building, with its conventional hour glass and wings, is but one of many evidences everywhere seen about the house, in design, decoration, and furnishing, of the cultivated taste of the artist who has here made his home.

MR. HARRY FENN'S COTTAGE—HALL, LOOKING INTO DINING ROOM

Metallic Cement.

The following recipe for a metallic cement for repairing broken stone is given by Prof. Brune of the School of Fine Arts. It was used in the restoration of the colonnade of the Louvre, of the Pont Neuf, and of the Conservatoire des Arts et Metiers. It consists of a powder and a liquid.

The Powder.—Two parts by weight of oxide of zinc, two of crushed limestone of a hard nature, and one of crushed grit, the whole intimately mixed and ground. Ocher in suitable proportions is added as a coloring matter.

The Liquid.—A saturated solution of zinc in commercial hydrochloric acid, to which is added a part, by weight, of hydrochlorate of ammonia equal to one-sixth that of the dissolved zinc. This liquid is diluted with two-thirds of its bulk of water.

To use the cement, one pound of the powder is to be mixed with two and one-half pints of the liquid.

The cement hardens very quickly and is very strong.

How to Make Money.

Mr. L. P. Tibbals, of 820 Broadway, is pretty generally known by a great many children in this city. He has sold toys and taught Sunday-school a good many years, and he is still a vigorous young man, full of good works. Mr. Tibbals has formulated a very ingenious rule, showing the profit a family may derive from a single whisky-drinking member, as follows:

One gallon of whisky costs about $3, and contains on the average 65 ten cent drinks. Now, if you must drink whisky, buy a gallon and make your wife the barkeeper; then, when you are dry, give her ten cents for a drink. When the whisky is gone, she will have, after paying for it, $3.50 left, and every gallon thereafter will yield the same profit. This money she should put away in the savings bank, so that when you have become an inebriate, unable to support yourself, and shunned and despised by every respectable person, your wife may have money enough to keep you until your time comes to fill a drunkard's grave.

A Strong Man.

There is a man on the Darson River, below Dayton, named Angela Cordella, who claims to be the strongest man in the world. He is an Italian, aged twenty-eight, and stands 5 feet 10 inches, weighing 198 pounds. His strength was born with him, for he had no athletic training. He differs from other men chiefly in the osseous structure. Although not of unusual size, his spinal column is much beyond the ordinary width, and his bones and joints are made on a similarly large and generous scale. He has lifted a man of 200 pounds with the middle finger of his right hand. The man stood with one foot on the floor, his arms outstretched, his hands grasped by two persons to balance his body. Cordella then stooped and placed the third finger of his right hand under the man's foot, and, with scarcely any perceptible effort, raised him to the height of four feet and deposited him on a table near at hand. Once two powerful men waylaid Cordella, with intent to thrash him, but he seized one in each hand and hammered them together until life was nearly knocked out of them.—*Va. Footlight.*

Sensitive Reagent for Albumen.

M. Simon.—The most sensitive reagent is that of Mehu, a mixture of 1 part crystalline phenic acid with 1 part acetic acid and 2 parts water.

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Tunnel under the St. Clair River.

Work is actively in progress on the preliminary excavations for the tunnel under the St. Clair river, which is intended to connect the Grand Trunk and Chicago & Grand Trunk Railway systems at Port Huron and Sarnia. It will be built by a company independent of the corporations owning and controlling these railways, but in their interest. At present the connection between the lines east and west of the river is maintained by a ferry, which transfers the trains between Point Edward, in Canada, and Fort Gratiot, in Michigan. This ferry is about three miles north of the proposed tunnel.

The location of the tunnel was determined by the following considerations, among others: (1) The comparatively small depth of water at the proposed crossing; (2) the tunnel and its approaches can be constructed on the same straight line; (3) the short length of new railway that will be required, the tunnel approaches connecting immediately with the main lines of both the Grand Trunk and Chicago & Grand Trunk Railways; (4) the distance to be run by all through trains to and from the Great Western division of the Grand Trunk will be reduced six miles, while it will not be increased for those to and from the Grand Trunk proper; (5) the favorable material in the bed of the river for tunneling, the borings showing that the rock is from ninety to ninety-five feet below the surface of the water, and that strong clay, in which not a trace of quicksand was discovered, overlies it; (6) the necessary land and right of way for the tunnel and its approaches will cost less than upon any other line within the limits available for selection.

The advantages to be gained by the construction of the tunnel are a reduction in the cost and time of transferring trains and a degree of regularity in the service not always attainable by the ferry, in consequence of the river being occasionally obstructed by ice in the winter and by vessels during the season of navigation.

The length of the tunnel will be 1 mile, of which 2,310 feet will be under the river, 1,160 feet under dry ground on the Canadian side, and 1,810 feet under dry ground on the American side. Of the portion under the river, 1,500 feet will be nearly level, having merely enough of fall toward the east to cause any water finding its way into the tunnel to flow in that direction. At either end of this part of the tunnel there will be a gradient rising 1 in 50, or at the rate of $105\frac{6}{10}$ feet per mile, which will be continued through the open cuttings forming the approaches. The total length of the ascent on the Canadian side will be 4,970 feet, and on the American side 4,900 feet. The length of the open cutting at the east end of the tunnel will be 3,270 feet, and at the west end 2,820 feet.

The depth of the lowest part of the tunnel below the surface of the water will be $80\frac{1}{2}$ feet; the minimum depth of the top of it below the bed of the river will be 15 feet. The tunnel will be for a single track only. In cross sections it will be circular, with a clear internal diameter of 20 feet.

The work which is now in progress is the construction of a trial heading or small cylindrical tunnel, with a clear diameter of six feet, under the river. This is being driven for the purpose of thoroughly testing the material. Although the borings were of a satisfactory character, there is of course a chance of pockets of quicksand being found between them. This heading, if successfully completed, will be of material assistance in the construction of the permanent work. It will be finished probably in about six or seven months. If the present operations are carried out satisfactorily, then the larger work of making the full sized tunnel will be proceeded with. The shafts at each end have been sunk to the bottom line of the tunnel without meeting with any difficulties, and so far the experience is all favorable.

Bradstreet's says the completion of this work must obviously have an important effect on transportation between the Eastern and Western States, and between Canada and the West. The route by way of the tunnel between Detroit and Buffalo or Toronto will be only eight miles longer than the direct route across the river at Detroit.

Progress of Electric Street Railways.

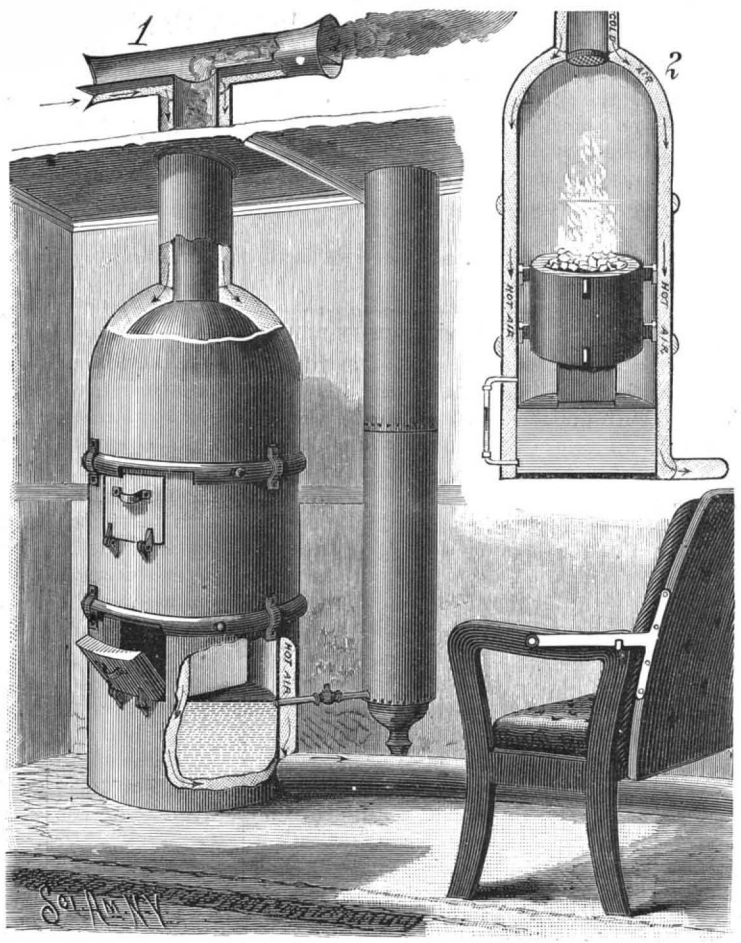
The Van Depoele electric street railways seem to be taking the lead in this country, being now in operation, with much success, in the following places: Minneapolis, Minn., Montgomery, Ala., Detroit, Mich., Appleton, Mich., Port Huron, Mich., Scranton, Pa.; also in Toronto and Windsor, Canada. In a short time the company will have electric cars running in Lima, O., and Binghamton, N. Y. More miles of electric railways on this system are now at work than all other systems put together.

SELF-EXTINGUISHING STOVE FOR RAILWAY CARS.

The accompanying engraving represents a car heater—the invention of Mr. James A. Faust, of Salt Lake City, Utah. It is most simple in construction, and is provided with a water reservoir, from which the water will flow to extinguish the fire should the heater be overturned or demolished by an accident. The outer shell or jacket is made watertight in the lower portion to form a water chamber. Within the shell are placed the firebox and ash pan, which are constructed with radial wings or ribs extending lengthwise, and by means of which they are connected with and suspended in the casing. An annular space is thus formed between the firebox and shell, as shown in the sectional view, Fig. 2, through which the water is free to pass should the stove be overturned. The doors of the stove are hinged at the bottom, while the opposite edge of each is overlapped by a band which encircles the stove and has a gap or recess, which, by turning the band, may be brought to a position coinciding with the door, to permit of its being opened. But by shifting this ring circumferentially, so that it will overlap and confine the closed door, the latter will be most securely held.

The air enters the top of the chimney, passes down and around the smokepipe and casing, by which it is heated, and then passes through pipes leading along the side of the car in the usual way. The course of the air is clearly indicated by the arrows.

It is evident that when the stove is overturned, the live coals will not be able to escape from the casing,



FAUST'S STOVE FOR RAILWAY CARS.

and the water in the reservoir will flow through the annular space and extinguish the fire. In order to prevent the coal and dirt from falling into the bottom of the casing, the annular space is covered by a guard plate, which is not fastened down, and will be at once displaced should the stove be overturned, so that it will not, therefore, obstruct the passage of the water. As the casing is made of heavy sheet metal, the danger of its being ruptured is greatly reduced. If considered desirable, a coil of pipe may be placed in the upper part of the casing for heating by steam instead of air.

Further particulars concerning this invention may be obtained, until April 1, from Mr. H. J. Faust, Grand Central Hotel, New York City.

Contagion in Barrels.

Health Commissioner De Wolf recently addressed a communication to the sanitary committees of the Legislature on a highly important subject. Dr. De Wolf states that it is the practice of families purchasing flour, lard, butter, etc., in quantities to sell their flour barrels, butter firkins, and lard tierces to persons who regularly call for them. These barrels, etc., are again sold to dealers, and they are repacked with similar articles. In very many cases, the Doctor says, these receptacles are kept in mouldy places, and frequently are purchased from families in whose houses infectious diseases have existed, and he considers the practice of refilling these receptacles as highly injurious to public health. A bill is now pending before the Legislature preventing the sale of these second-hand barrels, and the Health Commissioner will urge its passage and strict enforcement.—*Chicago Journal.*

Manganate of Baryta for Bleaching.

Manganate of baryta is a green crystalline powder, which is insoluble in water. Schad, in 1865, proposed to use it as a color in place of arsenic green; but so far it does not seem to have been applied in the printing trade. It is now proposed to use it for bleaching, and it is claimed that it acts equally as well as hydrogen peroxide, that it is cheaper and will keep better, that it acts on solutions, be they neutral, alkaline, or acid, and that it can be easily applied. The liquid which is to be bleached is heated, and the manganate of baryta, which has been previously ground together with water, is added until the liquid has been sufficiently discolored. The manganate of baryta becomes in this reaction decomposed into manganite of baryta, a brown insoluble substance which settles out, and can be separated by means of a filter press or by decantation, and into oxygen, which is in this case the bleaching agent. This material can, naturally, only be used in a limited number of cases; but in the preparation of certain fine chemicals it might be found useful. It is proposed to use it for discoloring glue, extracts, and other substances, and it is claimed that it does not decompose glue or tannin.

The Annual Attempt.

We are pleased to see that the annual attempt made by some member of Congress to nullify or irreparably injure our patent law system has been laid to rest for this year, at least; the bill introduced to render suit for infringement impossible where damages do not exceed $200, or where the purchaser of an infringing device bought it in *bona fides*, has been defeated.

This is proper. There are many among the vast number of patents recorded at Washington that cover, apparently, worthless devices, or such as are at least of insignificant value. Yet careful investigation and a knowledge of what has been accomplished in the mechanical world will show that nearly all have found employment, in some form or other, in some valuable invention that more than counterbalances in its widespread utility the insignificance of many of the members or parts of which it is composed.

Inventors are entitled not alone to protection, but respect; for while it is true that some "cranks" may be found among them, and though many of the patent devices are crude and impracticable, yet each one represents an original idea, which, combined with the original ideas represented in other devices, have made our people the foremost on the earth. It is not one inventor to whose genius is due the perfect machine of to-day, but it may be that the ideas of a thousand have been combined to produce that result, many of whom are dead, nearly all of whom are forgotten, and their names unknown, save as they are written upon the musty records of the Patent Office.

Without the encouragement to inventive genius the protection afforded by the patent laws provides, would any of the trades that are to-day in a prosperous and advanced condition have attained their standing? Some of the mightiest interests in the world would certainly have been far behind their present condition.

Unaided by the genius of humble, and sometimes cranky, inventors, the world with its billions of capital and its millions of strong and willing arms would have made but poor progress in bringing railroading up to its present state of perfection. The modern housewife is spared half her drudgery by the ingenuity of the inventor we dub a crank, and the workman finds his labors lightened and his wages increased by the tools and machines and many manufactured articles this same inventor has brought into practical shape.

We need not go outside of the plumbing trade in order to find evidence of what the inventor has accomplished for the good of the community. How many of the best appliances we use are protected by patents, while the materials we employ in all our work are cheapened directly or indirectly by improved and usually patented methods of production!

Under these circumstances we have a right to honor the inventor, and give him such protection for the smallest of his devices as will encourage him to improve on them and extend his efforts on behalf of society, already so deeply in his debt; and every effort, open or disguised, to impair the efficiency of our patent laws should meet with unflinching opposition from all interested in our mercantile and industrial progress.—*Sanitary Plumber.*

THE removal of superfluous hair from the skin is possible both by means of depilatories and by electricity. The former are mostly preparations of sulphide of barium or sulphide of calcium, and the process by electricity is very slow, each hair root having to be killed separately.

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Decay of Stone.

The dissolving power of atmospheric moisture seems to depend greatly upon the quantity of free carbonic acid gas it holds in solution; and though this quantity in any given volume of water be extremely minute, in course of time every substance which has an affinity for it will yield more or less to its action. The silicates of potash and soda, for instance, which are present in the igneous rocks—or, to dwell especially on the class of materials under our notice, in the Devonshire granites—are easily decomposed when rain water falls upon them, and, the feldspar being removed mechanically by any of the countless actions of nature, it leaves the other ingredients of the material exposed to the mechanical disintegration of changes of temperature. The simple carbonates of lime, again, sometimes absorb carbonic acid with much avidity, and pass into the state of the soluble bicarbonates; and thus, in proportion as the original face of the stone is removed, does the lower surface become exposed to the action of the rain. The rain water of such a town as London not only does contain large quantities of free carbonic acid, but it also contains sulphuric acid and ammonia, which are capable of exercising a very deleterious influence upon the carbonates of lime. In discussing, however, the effects of these agents upon building stones, it is essential to bear in mind the fact that the mechanical state of the elements of those materials greatly modifies their resistance. Those which are of a crystalline character do not yield so readily as those which are amorphous, and the crystallization produced by volcanic or plutonic influence appears to be even more permanent than that which takes place in the ordinary way. It follows from these considerations that the stones of an irregular, confused, earthy texture, which are able to absorb considerable quantities of moisture, and which contain silica in a soluble form, or the carbonate of lime, should never be employed in positions where rain water could lodge upon them, beat against them, or be taken up from external sources by capillary or other action. In positions exposed to any of the above dangers, none but non-absorbent and decidedly crystalline materials should be used, and as those qualities are almost exclusively possessed by dense stones, it may be considered that the mere specific gravity of a stone is a *prima facie* indication of its constructive value. But atmospheric moisture when absorbed into building stones acts upon them quite as much through the changes in its own volume, in passing from the liquid to the solid state at the time of frost, as it does by the chemical dissolution it produces. If the stone should be placed in such a manner as that water should accumulate in any perceptible quantities between its various layers, and if the position of those layers be such that the expansion of the water in freezing cannot take place freely, the respective layers containing the water will be violently detached from one another.

Now all stones, even the crystalline limestones and slates, have certain planes or directions of cleavage or of stratification, along which water flows more readily than in any other course. If the stones be placed in a building with those planes in a direction likely to retain rain falling upon, or absorbed through, the surface (which is the case when stones are placed "bed to weather"), disintegration must ensue unless the edges of the beds be left free, and even in that case there is danger of frost detaching one layer from another.—*G. R. Burnell, in the Architect.*

Torpedoes and Torpedo Boats.

Mr. Edward C. Peck has submitted to the English Government a proposal for a torpedo to be propelled by steam obtained from the boiler of a torpedo boat through a superheater. The outside skin of a torpedo is utilized as a surface condenser. It is claimed that such a torpedo, 14 ft. by 14 ft., and with an explosive charge of 100 pounds of gun-cotton, would weigh only about one-half of those in use, and would have a speed of over 30 knots and a range of about 2,500 yards. The cost would be reduced nearly one half. M. Lisbonne, who was recently Director of Naval Constructions in France, has published in the *Genie Civil* a table of English, French, German, Italian, and Russian torpedo boats of all sorts and descriptions:

England.....	boats,	156;	tonnage,	23,912;	cost,	$7,317,000
France.....	"	143;	"	20,450;	"	6,267,400
Germany.....	"	156;	"	14,597;	"	4,467,600
Russia.....	"	115;	"	5,104:	"	1,560,600
Italy.....	"	89;	"	7,966;	"	2,437,600

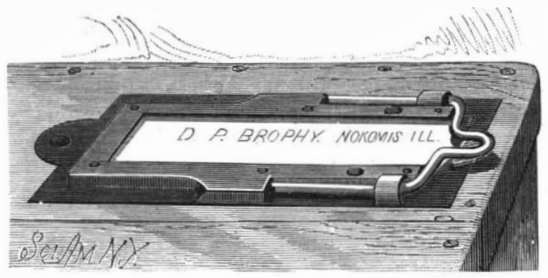
According to M. Lisbonne, where France is most behind England is in torpedo boats of a large size, of from 38 to 45 meters in length.

It is stated that the Italian Government has ordered from the firm of Schwartzkopf torpedoes to the value of 6,000,000 marks.

THE great value of isochromatic plates in micro-photography has been demonstrated by Dr. Crookshank, who exhibited to the Royal Microscopical Society of London micro-photographs of bacteria obtained without staining the objects with aniline, as in Koch's process, and he has still more recently exhibited a photograph showing the flagella of a vibrio.

IMPROVED LABEL HOLDER.

The case of this simple and efficient label holder consists of an inner plate and a somewhat smaller outer plate, which are riveted together. The inner plate is made solid, and is provided with holes through which screws or nails may be driven, to attach the holder to a trunk or other receptacle for holding goods of any kind. The outer plate is a narrow U-shaped strip formed all around its inner margin with



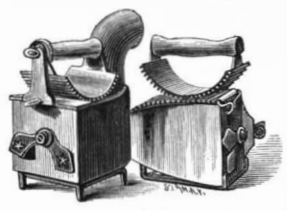
BROPHY'S IMPROVED LABEL HOLDER.

a rabbet to receive the label, which extends a little beyond the other end of the plate. A spring is connected at the opposite extremities of its side arms to the case. The arms extend forward to the ends of the outer plate, where they join the cross bar of the spring. The center of the bar is bent to form a loop, to the under side of which is fixed a lug formed with a square inner shoulder, which normally stands in front of the outer end of the label, while the cross bar of the spring presses down on top of the label, which is thus held securely in the case. Loops fixed to the case hold the spring in proper position edgewise of the case, and also limit the upward movement of the spring when it is lifted away from the face of the label. To place a label in the case, it is only necessary to slip the end of the label between the raised latch lug and the inner plate, and then push it inward until the lug springs down behind its outer end.

This invention has been patented by Mr. Dennis P. Brophy, of Nokomis, Ill.

THE MULTUM-IN-PARVO IRON.

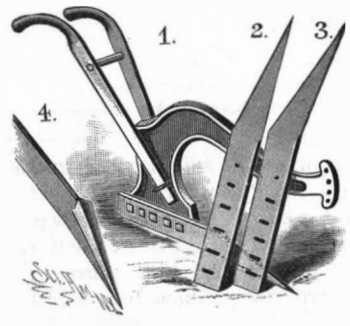
The sadiron herewith illustrated is the invention of Mr. H. S. Pease, of Peoria, Ill. It is a miniature stove, with polished surface, and is used in the same manner, and is as convenient, as the common flatiron. Upon the under side of the handle, which is detachable, is a



curved fluting iron, corresponding with a fluted piece fixed to the side of the main iron, as shown in the right hand view. The iron is heated with charcoal, but live coals from a common wood fire are equal to the very best charcoal, if made of good, solid wood. This iron does the work of an entire set of ordinary irons, as the heat can be so regulated, by means of the dampers at the heel, as to keep the iron at a uniform temperature. As the iron does not come in contact with a range, it is always clean and nicely nickel plated. The many advantages to be derived from a fluting, polishing, and smoothing iron which is self-heating and extremely simple in construction are apparent.

IMPROVED PLOW.

The plow here illustrated is the invention of Mr. John Babcock, of Walton, N. Y. It is especially adapted for penetrating and breaking hard earth. The standard and beam are cast in one piece, and attached to the former are the handles and point. The point is a plate of steel, beveled both at top and bottom, at one end, to form a drooping point, as shown in the several figures. Back of the bevel the point is straight, to prevent it from entering the ground too far, and through it are several openings, for the passage of bolts for se-



BABCOCK'S IMPROVED PLOW.

curing the point to the standard. In some cases these openings are made in the form of vertical slots, so that the whole point may be set at an angle on the standard, and in other cases, when these slots are used, the entire lower edge of the point is made straight, as shown in Fig. 2. In Fig. 4 the beveled edge is upset to form side flanges for spreading the dirt.

Steno-Telegraphy.

Mr. G. A. Cassagnes, editor of the *Chronique Industrielle*, has recently described before the French Academy a method of transmitting telegrams which he calls "steno-telegraphy," and which is a combination of mechanical stenography with telegraphy.

The apparatus are as follows: At the transmitting station: a keyboard perforator, an automatic transmitter, and a distributer. At the receiving station: a distributer, polarized relays equal in number to the keys of the keyboard of the perforator, and a printing apparatus.

At the transmitting station, the keyboard of the perforator, maneuvered by one stenographer only, perforates in a band of paper a series of apertures arranged in horizontal lines, and each of which represents at least one syllable. The perforating is done at the rate of two hundred or more words per minute.

Through the very position assigned to it by the maneuvering of the keyboard, each aperture corresponds to a definite stenographic sign, which is to be printed upon the stenographic band of paper at the other station.

The perforated band is placed under the transmitter, where it remains immovable, as does also the band that is to receive the impression at the receiving station. If, through one of the apertures, the transmitter then automatically emits a current that passes into the line wire through the brush of the transmitting distributer, this current, on reaching the other end of the line, will be received by the brush of the receiver, which will keep up a continuous motion synchronous with that of the brush of the other station, and will actuate a polarized relay that closes a local circuit designed to print the sign corresponding to the current emitted at the transmitting station.

Since, in consequence of the very revolution of the distributing brush at the transmitting station, the same operation is repeated for each of the apertures in succession (which form a small, perforated, horizontal line), and since the paper at the two stations remains always immovable, a horizontal line is printed, and the line of apertures of the transmitting station is thus converted into a line of signs, representing at least one syllable, at the other station.

The bands then move forward by the space of one interline at both stations, and everything is in readiness for the printing of another line, and so on.

The number of syllables that may be thus printed during one revolution of the brushes depends, then, solely upon the number of contacts into which the distributer and receiver of the two stations can be divided, and such number itself depends upon the possible duration of the emissions, that is to say, upon the length and state of the telegraph wire.

Numerous experiments made upon the French lines have given the following speeds of transmission with a single line wire:

1. As far as 210 miles, 400 words per minute; and with two keyboards, 24,000 words per hour.
2. As far as 390 miles, 280 words per minute; and with two keyboards, from 16,000 to 17,000 words per hour.
3. As far as 540 miles, 200 words per minute; and with a single keyboard, 12,000 words per hour.

The transmitting, moreover, may be done either entirely in one direction or the other, or simultaneously, partly in one direction and partly in the other, according to requirements.

Steno-telegraphy, then, affords a means of greatly increasing the number of words transmitted by the same conductor. It may consequently be employed to great advantage in telegraphy, since it prevents the encumbering of the wires, by utilizing each of them more perfectly than has been done in the past.

Again, it permits of stenographing a discourse while it is being delivered, and of transmitting it at the same time to distant points. In this way, the first sentences of a discourse begun at Paris at two o'clock might be put in type ten minutes afterward in a printing office at Marseilles; and as the keyboard and electric transmission (without relays and through a single wire) never cease to follow the orator, the latter's discourse might be distributed simultaneously in the two cities, which, as well known, are 578 miles apart.—*Revue Internat. de l'Electricite.*

Effect of Fog on the Electric Light.

It was recently announced that the electric light on May Island, at the mouth of the Firth of Forth, had been sighted in clear weather from a distance of forty-six miles at sea, by the master of the Swedish steamer Frithiof. The same steamer arrived at Granton recently, and the master of the vessel reports that early in the morning, when there was a very dense fog prevailing, he had got within three miles of the May Island before the very powerful electric light recently placed in the lighthouse could be observed, and that it then only resembled a dim light from a single candle. These two facts afford a very marked contrast in regard to the penetrative power of the electric light in clear weather and in a dense fog. It is well that such data should be put on record and accumulated for future reference.

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Catching the Octopus.

The United States Fish Commission print in one of their recent bulletins an excellent report by Mrs. Emma Metcalf Beckley, Curator of the Hawaiian National Museum, on "Hawaiian Fishing Implements and Methods of Fishing." The writer gives some curious details about octopus fishing. The smaller kinds of octopus, which live in shallow water, are caught by women, who do their work with remarkable skill. They can tell whether an octopus is in a hole whose entrance is no larger than a silver dollar, and, plunging their spears in, they invariably draw one out. The larger kinds of octopus, which are always found in deep water, are caught by men with cowries, generally of the Mauritiana, but sometimes of the tiger species. An octopus will not rise to a large spotted or ugly cowry, so the fishermen have to take care that the spots on the back of the shell are very small and red, breaking through a reddish brown ground. Cowries with suitable spots, but objectionable otherwise, are slightly steamed over a fire of sugar cane husks, a process which gives them the desired hue. The fisherman, having arrived at his fishing grounds, first chews and spits on the water a mouthful of candle nut meat, which renders the water glassy and clear; he then drops the shell with hook and line into the water, and swings it over a place likely to be inhabited by an octopus. The moment an octopus perceives a cowry, it shoots an arm out and clasps the shell. If the shell is of the attractive kind, one arm after the other comes out, and finally the whole body of the octopus is withdrawn from the hole and attaches itself to the cowry, which it closely hugs, curling itself all around it. The creature remains very quiet while being rapidly drawn up through the water. Just as it reaches the surface, the fisherman pulls the string so as to bring its head against the edge of the canoe, and it is killed by a blow from a club which is struck between the eyes. This must be done rapidly, before the animal has time to become alarmed; for if it lets go the cowry it becomes a dangerous antagonist, and there is risk of the fisherman being squeezed to death. The cutting off of one or more of its eight arms does not affect the rest in the least.

Apes as Workers.

It was reported by telegraph the other day that Mr. Parkes, a farmer at Kingston, in Kentucky, had succeeded in training seven large monkeys or apes to work in his hemp fields, and to break and prepare the hemp for market. Mr. Parkes, according to the dispatch, has found that they do the work more rapidly and better than the negroes, and at one-quarter the cost. The apes, it is said, were sent to him by a brother in Africa, who had seen them put to similar uses there, and Mr. Parkes is so well satisfied with the results of his experiment that he has ordered ten more of the animals.

Whether this particular story be true or false, there is no doubt that the more docile and intelligent of apes have been instructed to perform work very like that to which Mr. Parkes is said to have trained his seven monkeys after four months of patient tuition. Mme. Clemence Royer, in a recent article in the *Revue Scientifique* on the mental faculties of monkeys, shows that they are well adapted for some kinds of domestic offices and acquit themselves gracefully in them, and she cites cases where they have been made exceedingly useful in field and other work. Pyrard, the French traveler of two centuries ago, says that in his time the colonists of Sierra Leone employed chimpanzees in carrying water and beating of mortars, and Breton has in his Chinese pictures a representation of monkeys gathering tea leaves on the tops of one of the steep ridges of Chansung. The ancient Egyptians, too, obtained considerable services from the cynocephalus, or variety of baboon, an animal so remarkable for its intelligence that it was selected by them as the symbol of intellect. Buffon describes a female chimpanzee at Loango which could make the beds, sweep the house, and help turn the spit. Houzeau expresses the opinion that these female monkeys would make excellent nurses for children, their milk being exceedingly rich in butter.

Mme. Royer, therefore, comes to the conclusion that a time is coming "when these races, bred by man, will render great services in daily life and industry, and will contribute to the general progress." There is nothing in such a prediction, she continues, which does not rest on scientific premises, and nothing in it to laugh at, after the manner of the smart young men who are now getting up funny articles on Mr. Parkes' experiment.

The ape is unquestionably the most intelligent and the most manlike of the lower animals, both physically and mentally and morally. He may be far away from the superior races of men in intellect, but the difference between him and the lower races is much less marked. The black chimpanzees of Africa have feasts like those of the negroes. They live in communities, fight in concert, and care for their wounded. They are very clever in the use of their hands and arms, throwing stones better than street boys. Buffon's black chimpanzee knew how to unlock a door, and if he did not find the key in the lock, would hunt for it. The monkey took its meals like a well-bred person, ate with a spoon and fork, used a plate, and served itself with wine. In one of her letters from the Malay Peninsula, Miss Bird describes a dinner to which she was invited, and at which her companions were two apes. "The apes had their curry, chutney, pineapple, eggs, and bananas on porcelain, and so had I," writes the enterprising lady, who speaks of another ape, which was an important member of the family of the British resident at Klang, as walking on its hind legs, and going along quietly by her side like a human escort. It had not even a rudimentary tail, and when it sat with its arms folded it looked like "a gentlemanly person in a close fitting suit."

The worse defect of monkeys is that they are inveterate thieves. They look upon stealing as fun, and therefore will pilfer even when they have no desire for what they take. Mme. Royer tells us that "they are capable of sacking a house and carrying off everything movable in it with the system and concert of a band of robbers. They observe a kind of discipline in their operations, and post their scouts to inform them in season when it is time to run away." The monkeys in Sumatra, according to Cesare Moreno, steal fruits and vegetables from gardens, and will plunder houses. "Forming a line, in order to pass their spoils from hand to hand, they scale the walls, enter at the doors or windows, and leisurely pillage all they can find." They are also very greedy, and will get tipsy when they have the chance, and a drunken ape seems more like a man than ever.

If, therefore, Mme. Royer's prediction is verified that the time is coming when apes will be added to the industrial force, it will probably become necessary to increase our police protection, unless pious education shall succeed in conquering the natural depravity of the monkey.—*N. Y. Sun.*

Preservation of Eggs.

Australian eggs are preserved in the following simple manner: The vessels in which the eggs are to be placed are glass jars with patent stoppers, vulcanized India-rubber joints making them perfectly air tight. As soon as the eggs have been collected, the jars are stood in hot water for some time, and left until the air in them has become thoroughly warm and rarefied. The jars having been heated, the eggs are wrapped up in paper to prevent them knocking together, and placed in a warm receptacle, their pointed ends being uppermost. The jars are immediately closed up, and then, and not until then, are removed from the hot water. It is said that if this process is skillfully carried out, the eggs will be as fit for the breakfast table as the day they were laid, many months after they were put in the jars. The great secret of success in carrying out this method is, no doubt, to thoroughly heat the air in the jars. The eggs will stand a better chance of keeping, if the paper in which they are packed is previously baked and used warm. Patent stoppered jars are not absolutely necessary, any stopper answering which effectually excludes the air. At the late Birmingham, Eng., cattle show, prizes were offered for the best dozen of preserved eggs, and they were given, as was the case the year previous, to those preserved in simple lime and water, or packed in dry salt. Samples were shown covered with melted suet, beeswax, oil, or lard, and all these were good. But strange to say, one exhibit which had been rubbed over with pure vaseline as soon as laid was the worst of all. All the eggs were putrid.

Plaster Casts from Photographic Cliches.*

It is sometimes desirable to convert a photograph (say of certain of the *Microzoa*) into a plaque, which can be mounted on a tablet and exhibited in a case. This can be done by taking plaster casts from reliefs in gelatine. They are producible in two ways: 1. On the commercial dry plate. 2. On *cliches* of bichromated gelatine.

1. On the commercial dry plate. I have experimented with a few makes, but find the gelatine too soft in most cases. One make (possibly containing bichromate) gives tolerably good results, but different batches differ in their power of resisting the rather severe treatment to which they are subjected. The treatment is quite simple, and consists of dipping the plate (it must not be alumed) for a few moments in water, kept at a uniform heat of 90° Fahr. by an automatic gas regulator. I should think that a plate could be put on the market suited to this particular purpose, and its utility in the various photo-mechanical printing processes would insure a steady demand for it.

While the relief is still moist and at its best, pour on No. 1 plaster, as in ordinary plaster casting, mixed with a little alum to harden it. When dry, the plaster leaves the gelatine without much trouble, no lubricator being needed. The resulting cast may, of course, be colored if desired.

2. On bichromated gelatine. This method is well known. It has the great advantage of being capable of giving a higher relief if required, according to the thickness of the gelatine. On a moderately hard gelaline hot water may be used, a fact known almost as long as photography. A little caution must be exercised in the choice of a subject. Their microscopied *sections* are, for obvious reasons, unsuitable where strict accuracy is required; but when the lights and darks of the *cliches* (upon which intaglio and relief depend) nearly correspond to the real intaglio and relief of the object photographed, the resulting cast will, of course, be accurate as well as beautiful.

THOMAS STOCK.

*A communication to the Edinburgh Geological Society.

Trade Schools.

The action taken by the Master Plumbers' Association of New York in recognizing the trade school as one of the future sources of our supply of skilled workmen, following the adoption by the master stone cutters of a similar course, is attracting considerable attention from trades unions. The leaders of these organizations have virtually committed them to the policy of restricting not only the supply of workmen, but the hours of labor, when in their power, so as to make of each particular craft as much of a close corporation as possible, providing plenty of work for all who may be admitted within the limits, but leaving none for outsiders, and taking from them every possible chance of entering the precincts of the trade organizations.

The persistency with which they have adhered to this principle, the importance they attached to it, and the sacrifices they were willing to make to maintain it, have been abundantly demonstrated during the strike of the journeymen plumbers in New York.

Hitherto, the workman has claimed the sole right to undertake the education of the boy entering his trade, and the master has been for the most part satisfied to let the lads shift for themselves. They come to spend a large portion of the first year or two years of their shop life in the performance of little else but menial duties; and progressing from this department almost at the option of the journeyman to the stage at which they are first allowed to take hold of tools and material, they gradually reach the period when they are considered by the union to which they aspire to belong entitled to a full day's pay as a journeyman. There is no attempt to determine their value as mechanics; by virtue of their payment of the union entrance fee, and the receipt of a card, they are entitled to the same wages as the men who have spent a lifetime at their trade.

In no profession or calling is this crude system adhered to except in mechanical trades—just where a man's value depends wholly upon the degree of skill he possesses. The doctor, the lawyer, the engineer, the architect, even the bookkeeper nowadays, must attain a certain degree of proficiency at his own expense before he becomes entitled to recognition in the vocation he has chosen; only the skilled mechanic is a beggar—depending on the charity of his fellow workman for the means of learning his business.

The masters are beginning to realize the helpless position to which this condition of affairs reduces them, and already in some trades they have been looking for some factor that will aid them in assuming control of the training of young aspirants for their employment. The trade school offers at once a means of effecting the desired change and at the same time of improving the capacity of the mechanic; and though, in the course of the transformation, the union may lose some of its arbitrary hold upon the workman, in our opinion both union and workman will be benefited by the change. That work done encourages other work, has long been recognized as a fact, and the character of the work regulates the nature of the demand. If for the present slipshod manner of training boys we substitute a strict course of technical instruction, and establish at the same time a standard of proficiency for our workmen, we limit the number of members of a trade in time to those qualified to practice it, and this no workman having his own interest at heart can oppose. The trade school will either deprive the union of the dead timber that encourages the progress of the progressive workman and advance the interests of every craft recognizing its value, or it will convert these organizations into a stagnant pool of incompetency that all employers would shun, if they oppose the education of the apprentice. The trade school has come to stay; the trade union can choose between a dignified existence or an ignominious extinction, according as it encourages or opposes this coming factor in the progress of our industrial classes.—*Sanitary Plumber.*

A NOVEL and valuable application of photography has been made by the Century Company, combining the complete preservation of valuable copy against accidental loss or injury by fire or otherwise with the greatest convenience in storage and handling. Over 25,000 sheets of copy of a work on its way through the press, with interlineations, corrections, and additions, have been photographed on a reduced scale of only 1¼ × 2 in. to the page, but easily legible upon magnification.

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ENGINEERING INVENTIONS.

A low water alarm and indicator for boilers has been patented by Mr. Charles Hults, of Torch Lake, Mich. In connection with a jointed frame and pivoted toggle levers is a properly connected float, so arranged that when the water in the boiler has fallen below a prescribed line, the fact will be made known by an indicator upon the boiler, together with an alarm from the whistle.

A car coupling has been patented by Mr. Vladimir S. Bekofsky, of New York City. It has a hooked drawhead held loosely in a hollow drawbar, a sliding plate with cam slot acting on the hooked drawhead, with other novel features, the design being such as to allow the cars to play in vertical and in horizontal planes without fear of casual uncoupling.

A car coupling forms the subject of a patent issued to Messrs. Henry Lehr and Charles Verch, of Albany, N. Y. Combined with a hook pivoted to the drawhead, and adapted to engage a stud of an opposing drawhead, is a rod with an arm adapted for movement in front of the hook to hold it raised, the coupling being intended to couple automatically, to be readily uncoupled, and to be adjusted at will to prevent coupling, without requiring train men to go between the cars.

MISCELLANEOUS INVENTIONS.

Beveled glass forms the subject of a patent issued to Mr. Charles P. Oudin, of New York City. This invention consists in making the plate with an offset between the bevel and the face of the glass, whereby the face of the glass is made to stand out from the bevel in clearly defined lines.

A safety pocket has been patented by Mr. Eli Strouse, of Baltimore, Md. It is formed in the back of the vest, and located in the lower right or left corner, concealed and securely closed by the buckle or back strap of the vest, which extends across the mouth of the pocket and forms the front side of the mouth.

A combined sewing machine cover and stool has been patented by Mr. Guul O. Brager, of Osage, Iowa. The cover is adapted to inclose the head of a machine, and has a leg frame fitted within it, which lies within the cover when the latter is adjusted to the machine, and are adapted to support the cover as a stool when so desired.

An automatic elevator gate has been patented by Mr. George T. Fallis, of St. Joseph, Mo. It is a sliding gate hung on ropes having weights, with a device for locking the gate in an open or a closed position, controlled by the movement of the elevator carriage, together with a novel construction for securing the gate in the guides.

A spool holder has been patented by Mr. Canova T. Cagle, of Beersheba Springs, Tenn. It consists of a light base plate, easily held by its retaining pin to the front of a lady's dress, and carrying an arm and stud on which spools of thread of different size may be readily adjusted, the device also carrying a miniature pincushion and thimble clamp.

A wheel hub has been patented by Mr. Andrew J. Morrison, of Houghton, N. Y. This invention relates to the construction of the spoke tenons, the hub proper having improved spoke sockets, and an oil box and sand box, the combined hub and boxes, except the spoke ring, to be made of iron, steel, or brass, and the spoke ring to be made of wood or compressed paper.

A churn dasher has been patented by Mr. John L. Maxwell, of Bentonville, Ark. It is formed of a series of beveled rings, having between them openings which converge toward the top, making a form of dasher which can be readily forced through the cream and is very efficient in separating the butter, the invention being an improvement on a former patented invention of the same inventor.

A key operating device has been patented by Mr. David A. Childs, of Columbia, S. C. It is a split pulley adapted to be clamped upon the shank of a door key, and grooved in its periphery to receive a cord extending over one or more pulleys to a distant point, so that when the cord is pulled, it will turn the key to lock or unlock the door, according as the cord is wound.

A gas and air compressor and dry vacuum pump has been patented by Mr. August Osenbruck, of Hemelingen, Prussia, Germany. An ordinary slide valve gear is employed, with secondary cut off valve, and the cylinder has pressure relieving valves, so that, the secondary cut off being permanently adjusted for a certain difference between the exhaust and compression pressure, variations will be provided for by the relieving valves.

A mosquito canopy has been patented by Mr. William W. Barnum, of Indianapolis, Ind. It consists of an adjustable slatted rectangular frame, with pins and slotted standards adapted to receive them, pivoted supporting bars and other novel features, intended to make a cheap and efficient frame for supporting the ordinary fabric netting, and one that can be attached to any ordinary construction of bedstead without marring it.

A furnace for hothouses has been patented by Mr. William A. White, of Staatsburg, N. Y. Against two or more sides of a many sided shell or body are arranged independent coils of return or serpentine construction, to heat water, and thus transmit the heat, the coils being subject to separate control, and so arranged that the flow of hot water may be conveniently turned on or off from any part of the structure, and the supply in different directions readily regulated.

A hot water pipe arrangement for heating purposes forms the subject of another patent issued to the same inventor. The invention, while applicable to various heating purposes, is more especially designed for heating hothouses and similar structures, and provides separate hot water circulating coils above the heating coils, so connected that a rising circulation is obtained.

NEW BOOKS AND PUBLICATIONS.

ONE THOUSAND AND ONE QUESTIONS AND ANSWERS IN UNITED STATES HISTORY. By B. A. Hathaway. Lebanon, O.: A. H. Hathaway. 1887. Pp. 99.

This is a convenient little manual, whose scope is sufficiently indicated by its title. It is dedicated especially to teachers, but one use for it would seem to be in the preparation for civil service examination. It is neatly printed, and is a good companion piece for other question and answer books by the same author.

STEAM BOILER EXPLOSIONS WHICH OCCURRED IN VICTORIA BETWEEN APRIL, 1884, AND MARCH, 1885. By A. C. Wannan. Melbourne: Edward J. Stephens. 1886. Pp. 30.

This is a reprint of a paper read before the Victorian Engineers' Association; with it is reprinted the report of the discussion that followed its reading. It contains one illustrative plate. The paper, it is stated, was inspired by the extraordinary number of explosions that occurred in the period designated in the colony. It is a useful contribution to the literature of boiler explosions, and the author shows much common sense in his treatment of the subject and remedies suggested.

* * Any of the above books may be purchased through this office. Address Munn & Co., 361 Broadway, New York.

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The charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

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Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.

Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(1) C. H. La P. wants a cheap method for melting rubber. A. Rubber can be melted by heating in a can over a water bath, that is, the heat must be hot enough to melt, but not burn.

(2) B. F. R. asks: Why is stale bread considered more wholesome than new? A. Presumably because it is more friable and porous, and not so tenacious.

(3) G. A. B. asks: Must the wire for armature and magnets in dynamos necessarily be all of one piece, or can several pieces be used, provided that they are very carefully spliced and of the same gauge? A. Joints in the coils of field magnet and armature should by all means be avoided. If it is necessary to join them, they should be soldered with resin flux, not with acid.

(4) J. N. W. writes: I want to construct a small dynamo, similar to the one illustrated in SCIENTIFIC AMERICAN SUPPLEMENT, No. 161. 1. How many pounds of wire will it require to wind the magnets? A. Five or six pounds for the field, and a half pound for the armature. 2. If I increased the length of the magnets and armature, would it increase the power in anything like proportion? A. The power will increase in a more rapid ratio. 3. Will it give a sufficiently strong current to work a small incandescent lamp of four candle power, either with or without battery power, to excite the electro-magnets? A. Yes. 4. And will it answer to do electro-plating on a small scale? A. It is not adapted for electro-plating, but will answer on the small scale.

(5) E. A. S., Jr., says: In regard to an inquiry for a wash for preventing rabbits from gnawing fruit trees: A little tallow applied to the trees will preserve them from rabbits. Lard should not be used, as it is likely to strike into the wood. Some use a mixture of one part each of tallow and tar, but tallow alone is sufficient.

(6) G. O. K. asks how to make the composition that stove-pattern makers use for ornamenting their wood patterns. A. The composition is the same as used in picture-frame work, and made of whiting and thin glue worked in a stiff putty, then pressed into moulds of wood or metal. Oil the mould with boiled linseed oil to prevent sticking, using a brush for this purpose.

(7) J. P. L. asks: 1. Is it known why the apsides revolve? A. The revolution of the apsides is due mainly to the unequal attraction of the sun on the moon and the earth. The sun being outside of the moon's orbit distorts its otherwise true elliptic orbit, and produces a swinging motion of the plane of the orbit, with a corresponding motion of the nodes and apsides. 2. Is Kepler's observation of the radius vector, as laid down in his so-called second law, accurate? A. The second law of Kepler is accurate for elliptic motion of two bodies alone, but the perturbations of the planets among themselves produce deviations in the application of the law, which are well understood, and form some of the finest demonstrations of geometric astronomy. This is beautifully shown in the investigation of the center of gravity of the solar system, which is found to be moving in a set of very complex spirals, from near the center of the sun to as far as 800,000 miles from its center, or a half diameter beyond its surface, in a period of a little over 7,000 years for its completion.

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March 1, 1887,

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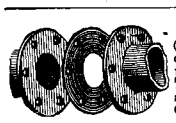

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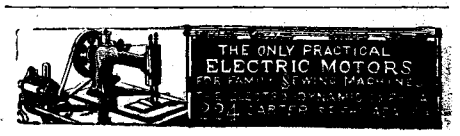

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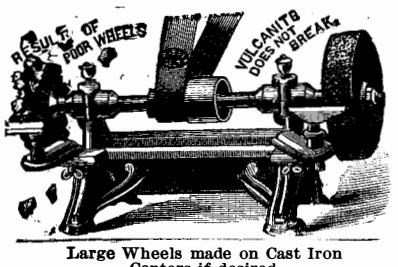

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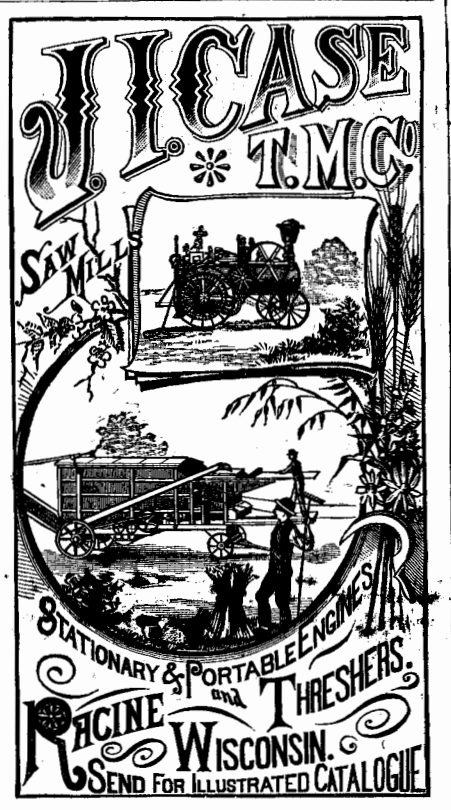

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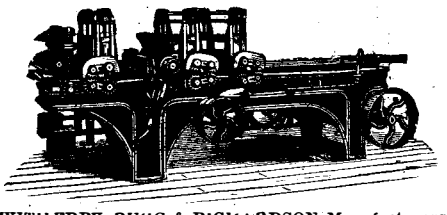

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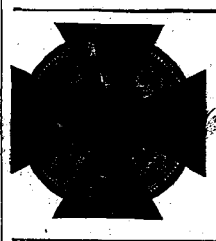

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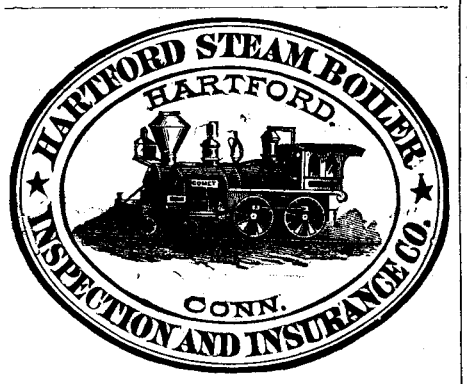

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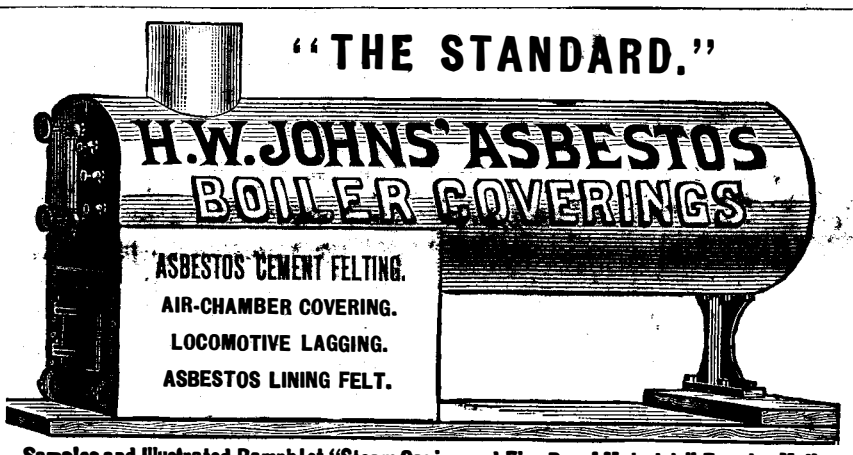

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